ENDANGERED SPECIES ACT

SECTION 7 INTRASERVICE FORMAL CONSULTATION

BIOLOGICAL OPINION

Activity: Application for Incidental Take Permit Submitted by Maine Department of Inland Fisheries and Wildlife for Maine's Fur Trapping, Predator Management ,and Animal Damage Control Programs

Consultation Conducted By: U.S. Fish and Wildlife Service, Maine Field Office

Approved By: Lary A. Zi 10-24-2014

Laury A. Zicari, Field Supervisor

Memorandum

Date: October 23, 2014

To: Assistant Regional Director, Ecological Services, Hadley, Massachusetts

From: Laury Zicari, Maine Field Office

Subject: Biological Opinion: Application for Incidental Take Permit submitted by Maine Department of Inland Fisheries and Wildlife for Maine's Fur Trapping, Predator Management, and Animal Damage Control Programs

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion evaluating the Service's proposed action of issuing a section 10(a)(1)(B) incidental take permit contingent on implementation of the Maine Department of Inland Fisheries and Wildlife (MDIFW) Incidental Take Plan for Fur Trapping, Predator Management, and Animal Damage Control Programs (hereafter referred to as the ITP[1]), dated October 24, 2014. The ITP was submitted by the MDIFW (hereafter referred to as the applicant) as a component of their application for a permit for incidental take of Canada lynx (*Lynx canadensis*) resulting from actions associated with its fur trapping, predator management (PM), and animal damage control (ADC) programs. This biological opinion is prepared in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.).

Section 7(b)(3)(A) of the ESA requires that the Secretary of the Interior issue biological opinions on Federal agency actions that may affect listed species or critical habitat. Biological opinions determine if the action proposed by the action agency is likely to jeopardize the continued existence of listed species or destroy or adversely modify critical habitat. Section 7(b)(3)(A) of the ESA also requires the Secretary to suggest reasonable and prudent alternatives to any action that is found likely to jeopardize the continued existence of listed species or result in an adverse modification of critical habitat, if any has been designated. This biological opinion assesses only impacts to federally listed species and does not address the overall environmental acceptability of the proposed action.

[1] The MDIFW refers to its conservation plan as an ITP, rather a habitat conservation plan, but it serves the same purpose and includes the same required elements. Consistent with the Environmental Assessment and Findings document, this biological opinion uses "ITP" in reference to the MDIFW's plan and "permit" in reference to the proposed incidental take permit (i.e., section 10(a)(1)(B) permit).

Section 7(a)(4) of the ESA provides a mechanism for identifying and resolving potential conflicts between Federal actions and proposed species or proposed critical habitats. To distinguish this procedure from consultation on listed species, it is referenced as conferencing. A conference is required only when an action is likely to jeopardize the continued existence of a species that has been formally proposed for listing under the ESA or destroy or adversely modify proposed critical habitat. However, at the discretion of a Federal agency, a conference may be conducted for a proposed action that may affect proposed species or candidate[2] species. A conference process is similar to the consultation process and may be either informal or formal.

This biological opinion is based on information from many sources, including the applicant's ITP, the Service's environmental assessment (USFWS 2014), information obtained from the scientific literature, and information provided by the applicant. Although coordination with the applicant regarding the ITP was initiated in 2005, intra-Service section 7 consultation regarding the ITP commenced in August 2014. A complete administrative record of this consultation is on file in the Service's Maine Field Office.

Description of the Proposed Action

As defined in the ESA section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas." The direct and indirect effects of the action must be considered in conjunction with the effects of other past and present Federal, State, or private activities, as well as the cumulative effects of reasonably certain future State or private activities within the action area.

In this case, the proposed action is the Service's issuance of a 15-year incidental take permit to the MDIFW. The permit will authorize take of Canada lynx, and issuance is predicated upon the Service's approval of the MDIFW's ITP. Implementation of the ITP's mitigation commitments is facilitated via a Memorandum of Understanding between the MDIFW and the Maine Bureau of Parks and Lands (MBPL) of the Department of Agriculture, Conservation and Forestry dated October 15, 2014 (ITP appendix 11a).

The proposed action is fully described in the ITP, which is incorporated by reference. The following provides a summary of key aspects of the action including covered lands, covered activities, avoidance and minimization measures, mitigation, monitoring, reporting, and changed circumstances.

The MDIFW's incidental take application requests a 15-year authorization for statewide coverage of all aspects of incidental take of Canada lynx associated with Maine's recreational fur trapping, predator management (PM), and animal damage control (ADC) programs. The MDIFW's trapping programs occur statewide. The upland fur trapping program is from mid-October through December, the PM program is from mid-October to mid-December, and the

[2] A candidate species is one for which the Service has on file sufficient information on biological vulnerability and threats to support a proposal for listing as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher priority listing actions.

ADC program is year-round. The MDIFW's trapping programs are described in detail in the final ITP (section 3.1) and final EA (section 1.3).

Maine's fur trapping program is intended to provide recreational opportunity for trappers and to manage some furbearer species using common wildlife management principles. Fur trapping activities occur throughout the State. Annually, approximately 6,000 individuals have furbearer trapping licenses or are otherwise authorized to trap. The MDIFW's best estimate of the number of trappers that annually trap in Canada lynx WMDs for species where incidental capture of Canada lynx may occur (i.e., marten, fisher, coyotes, bobcat, and fox) is 613. This includes about 396 trappers that set killer-type traps for marten and fisher and 318 trappers that set foothold traps for coyote, fox, and bobcats.

The PM program employs paid trappers to trap coyotes in or near deer wintering areas, which often are in areas of the state where Canada lynx also occur (final EA, appendix 3, figure 4). The ADC program addresses animal damage throughout the state. ADC activities in the areas where Canada lynx occur are often focused on problem beavers, but could be expanded to include coyote control in the future. Currently, about 27 trappers participate in the PM program and about 85 trappers are authorized to conduct ADC trapping to remove nuisance animals.

These programs all incorporate various trapping methods for capturing target wildlife species (such as red fox, eastern coyote, bobcat, fisher, and American marten). Trapping is somewhat indiscriminate in that non-target wildlife (such as Canada lynx) is sometimes captured incidentally by traps set for target species. There are two fundamental trapping techniques (and numerous trap and set types within each) employed to capture target species – non-lethal and lethal. Non-lethal (or restraining) trapping techniques (e.g., cage traps, foothold traps, cable restraints, etc.) are intended to capture and hold the target animal until the trapper can either release or dispatch the captured animal. Lethal capture techniques (killer-type traps that include conibear traps, rat traps, etc.) are intended to directly kill the target animal. The MDIFW's ITP addresses the potential for incidental capture of Canada lynx through both trapping techniques, as they have different consequences for the captured wildlife.

The MDIFW applied for an incidental take permit in response to a court approved settlement agreement between the State and several plaintiffs concerning the effects of trapping on Canada lynx. Under terms of a 2007 consent decree, the MDIFW agreed to a number of measures to address take of Canada lynx. Several of these measures, including requiring killer-type traps in Canada lynx areas be placed on elevated leaning poles, restricting use of exposed bait, and limiting the size of foothold traps, were incorporated into trapping regulations that have been in place since 2008. Information collected since that time has helped the MDIFW understand which consent decree measures have been effective for avoiding Canada lynx capture and injury. Upon receiving an incidental take permit, the MDIFW will request the court to vacate the consent decree and intends to rescind some measures (e.g., restrictions on the size of foothold traps, restrictions on the use of cage traps in northern Maine). The MDIFW has incorporated other provisions of the consent decree (e.g., regulations concerning exposed bait, requiring use of leaning poles for killer-type traps, and requiring exclusion boxes for killer type traps set on the ground) into its ITP and thus those measures will remain in place with issuance of an incidental

take permit. In addition, the ITP includes new trapping techniques (e.g., unlimited size for foothold traps, cage traps, wooden-based rat traps for weasels, and cable restraints).

The purpose of a conservation plan associated with an ESA section 10 incidental take permit is to minimize and mitigate the impacts of take from covered activities to the maximum extent practicable. In some respects the MDIFW's ITP is similar to how the agency has been addressing incidental capture of Canada lynx under its existing furbearer trapping program. That is because some strategies in the 2007 consent decree have helped to avoid Canada lynx capture and injury; those elements are adopted as core measures in the ITP. There are few other ways (except to limit trapping in Canada lynx areas, devices to exclude Canada lynx from killer-type traps) to reduce the number of Canada lynx incidentally captured through trapping. Therefore, most of the additional ITP measures are intended to improve how injuries are evaluated and managed, increase compliance with trapper regulations, and establish contingencies to address potential uncertainties regarding critical assumptions. The ITP also incorporates habitat-based mitigation that is intended to compensate for the lethal take anticipated in the plan (i.e., up to 3 Canada lynx over the 15-year permit period), and thus offset the effects of the take (i.e., loss of three Canada lynx over a 15-year permit period from a Canada lynx population that is currently at least 500 individuals in Maine with an average of 0.04 percent of the population annually). The MDIFW's ITP provides the basis for take authorization via a Service issued incidental take permit, pursuant to the ESA.

Action Area

For purposes of consultation under section 7 of the Act, the "action area" is defined by 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." In this case, the action area is coextensive with the ITP, which covers state-sanctioned trapping activities throughout Maine. Although measures to minimize incidental take of Canada lynx apply to the currently defined Canada lynx range, any Canada lynx caught in a legally set trap is covered by the ITP (ITP section 1.4). Hence, the action area for this biological opinion is all lands where trapping may be legally permitted in the state of Maine.

Species And Critical Habitat Not Likely To Be Adversely Affected By The Proposed Action

Gray Wolf

The gray wolf (*Canis lupus*) once ranged throughout most of North America, likely including Maine where it could have hybridized with the eastern Canadian wolf (*Canis lycaon*) (Rutledge et al. 2010). Wolves were extirpated by humans from over 95 percent of its historic range, including from Maine by about the 1890s (Krohn and Hoving 2010). Recovery has been successful in the northern Rockies and Great Lakes States. The gray wolf is federally listed as endangered in the Northeast, including Maine. However, on June 13, 2013, the Service proposed to delist the gray wolf and recognized the eastern Canadian wolf as the species that historically occurred in the Northeast (78 FR 35664, Chambers et al. 2012, Rutledge et al. 2012). Final listing decisions for the gray wolf or the eastern Canadian wolf were not available at the time of this biological opinion. There is no critical habitat designated for the gray wolf in Maine.

Although several wolves were found in Maine and elsewhere in the Northeast during the last 20 years, a breeding population is not known to exist south of the St. Lawrence River. A wolf was shot in Maine in the1993 and another trapped and killed in 1996. Isotope analysis indicates these animals were likely of captive origin (Kays and Feranec 2011). Two wolves were trapped and killed in southern Quebec near the Maine border in 2002 (Villemure and Jolicoeur 2004), and another shot in New Brunswick in 2012 (D. McAlpine, New Brunswick Museum, unpublished paper). The closest wolf population to Maine occurs in southern Quebec on the north shore of the St. Lawrence River.

Dispersing wolves could occasionally occur in Maine and be incidentally trapped by fur, PM, and ADC traps set for coyotes. The MDIFW proposes to allow foothold traps of unlimited size, which may be more effective at trapping and holding wolves than those currently allowed by the 2007 consent decree (maximum width of 5 3/8 inches) but the MDIFW is not seeking an ESA section 10 permit for wolves because they do not currently exist in the state (ITP section 2.2.2). If wolves were to become established in Maine (and they remained federally listed), the MDIFW would consider measures to protect those animals from incidental take.

The proposed action could affect wolves dispersing from Canada into the Northeast, but trapping of wolves has been a very rare event (one captive-origin wolf captured and killed in Maine in over 20 years) and the MDIFW has taken measures to address this possibility (ITP section 2.2.2). The ITP mitigation activities at the MBPL Seboomook Unit are similar to logging operations throughout northern Maine and would have no effect on wolves or their habitat. Because of the absence of a breeding population of wolves in the action area, extremely low probability of dispersal from inhabited areas north of the St. Lawrence River, and the even lower probability of trapping a dispersing wolf, we conclude that the effects of the proposed action on wolves are discountable. We find that the proposed action is not likely to adversely affect the gray wolf, and this species is not considered further in this biological opinion.

Eastern Cougar

The eastern cougar subspecies (*Puma concolor couguar*) once occurred throughout eastern North America. This large felid was a predator of ungulates (e.g., deer) and other small mammals (e.g., porcupines, snowshoe hare, and beaver). The last known eastern cougar in eastern North America was trapped and killed in Somerset County, Maine in 1938 (Parker 1998). The Service conducted a 5-year review of the status of the eastern cougar and concluded that the eastern cougar subspecies is extinct from eastern North America and plans to delist this subspecies (USFWS 2010). Although cougars have been documented in recent years in Maine, New Brunswick, Quebec, and elsewhere in eastern North America, the evidence suggests that these are of captive origin or dispersing from western populations and are not the eastern cougar subspecies. We find that the proposed action will have no effect the eastern cougar because wild populations no longer occur within thousands of miles of Maine, and this species is not considered further in this biological opinion. No critical habitat has been designated for this species in Maine.

Atlantic Salmon

The Atlantic salmon is an anadromous fish that spends most of its adult life in the ocean but returns to freshwater to reproduce. Atlantic salmon have a complex life history that includes adults returning to spawning rivers, eggs, parr, and smolt stages in freshwater, migration back into the ocean and extensive feeding migrations on the high seas.

The federally endangered Gulf of Maine Distinct Population Segment (GOM DPS) includes all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, and wherever these fish occur in the estuarine and marine environment (74 FR 29344). The marine range of the GOM DPS extends from the Gulf of Maine, throughout the Northwest Atlantic Ocean, to the coast of Greenland.

The proposed action is very unlikely to affect Atlantic salmon. While it is possible for Atlantic salmon to be captured in traps set for aquatic furbearers, the chance is very remote. For example, we are aware of two instances of adult Atlantic salmon being caught in killer-type traps set for otters in rivers in eastern Maine over 20 years ago (D. Tobey, MDIFW, pers. comm.). Furthermore, returns of adult Atlantic salmon to freshwater spawning areas are at extremely low levels (e.g., 495 in 2013 for all GOM DPS rivers, at: *http://www.nefsc.noaa.gov/USASAC/Reports/USASAC2014-Report%2326-2013-Activities.pdf* last accessed May 29, 2014). Very few adult fish are likely present in headwater streams where beaver and otter trapping may occur. Therefore, the probability of incidentally trapping a salmon is discountable.

Activities proposed as mitigation by the ITP will take place at the MBPL Seboomook Unit, which is within the range of the GOM Atlantic salmon DPS. However, these mitigation activities will occur in the upland and will not affect Atlantic salmon or their habitat. The potential exception is if roads are constructed to facilitate logging activities associated with the mitigation and road stream crossings are not adequately designed to allow for migration movements. The MDIFW and the MBPL will develop a forest management plan within three years of permit issuance that provides the specific details on forestry prescriptions, harvest locations, and timeframes that will be implemented to achieve the goal of providing 6,220 acres of young forest habitat to support Canada lynx within the 15-year permit period. The ITP stipulates that the Service will review the forest management plan to ensure that there will be no adverse effects to Atlantic salmon.

Because of the discountable probability of incidentally trapping a salmon and provisions to be included in the incidental take permit requiring review of the forest management plan for the MBPL Seboomook Unit to assure that any roads constructed to facilitate logging activities are adequately designed to allow for Atlantic salmon migration movements, we find that the proposed action is not likely to adversely affect Atlantic salmon. This species is not considered further in this biological opinion.

Atlantic Salmon Critical Habitat

Critical habitat is designated for the GOM DPS of Atlantic salmon (74 FR 29300) and includes much of the range of the salmon in Maine. Within the GOM DPS, the primary constituent elements for the conservation of Atlantic salmon include sites for spawning and incubation, sites for juvenile rearing, and sites for migration. The physical and biological features of the habitat that are essential to the conservation of Atlantic salmon are those features that allow Atlantic salmon to successfully use sites for spawning and rearing and sites for migration. These features include:

(i) Deep, oxygenated pools and cover (*e.g.*, boulders, woody debris, vegetation, etc.), near freshwater spawning sites, necessary to support adult migrants during the summer while they await spawning in the fall;

(ii) Freshwater spawning sites that contain clean, permeable gravel and cobble substrate with oxygenated water and cool water temperatures to support spawning activity, egg incubation and larval development;

(iii) Freshwater spawning and rearing sites with clean gravel in the presence of cool, oxygenated water and diverse substrate to support emergence, territorial development, and feeding activities of Atlantic salmon fry;

(iv) Freshwater rearing sites with space to accommodate growth and survival of Atlantic salmon parr, and population densities needed to support sustainable populations;

(v) Freshwater rearing sites with a combination of river, stream, and lake habitats, that accommodate parr's ability to occupy many niches and to maximize parr production;

(vi) Freshwater rearing sites with cool, oxygenated water to support growth and survival of Atlantic salmon parr;

(vii) Freshwater rearing sites with diverse food resources to support growth and survival of Atlantic salmon parr;

(viii) Freshwater and estuary migratory sites free from physical and biological barriers that delay or prevent access to spawning grounds needed to support a recovered population;

(ix) Freshwater and estuary migration sites with abundant, diverse native fish communities to serve as a protective buffer against predation;

(x) Freshwater and estuary migration sites free from physical and biological barriers that delay or prevent emigration of smolts to the marine environment;

(xi) Freshwater and estuary migration sites with sufficiently cool water temperatures and water flows that coincide with diurnal cues to stimulate smolt migration;

(xii) Freshwater migration sites with water chemistry needed to support sea water adaptation of smolts; and

(xiii) Freshwater and marine sites with diverse, abundant assemblages of native fish communities to enhance survivorship as Atlantic salmon smolts emigrating through the estuary.

Although Atlantic salmon critical habitat includes about one third of Maine, trapping activities do not affect these physical and biological features. About half of the MBPL Seboomook Unit, where ITP mitigation activities will be implemented, is within the Atlantic salmon critical habitat. Hence, we find that the ITP will have no effect on critical habitat designated for Atlantic salmon, and it is not considered further in this biological opinion.

Eastern Prairie Fringed Orchid, Furbish's Lousewort, And Small Whorled Pogonia

There are three federally listed plant species in Maine. The eastern prairie fringed orchid (*Platanthera leucophaea*; federally threatened species) and the Furbish's lousewort (*Pedicularis furbishiae*; federally endangered species) occur in northern Maine. The small whorled pogonia (*Isotria medeoloides*), a federally threatened plant, occurs in southern Maine. Critical habitat has not been designated for any of these species.

The likelihood of impacts from the trapping activities covered by the ITP on these plant species is discountable because traps are commonly set along waterways, road edges, fields, forests or in elevated sets (e.g. killer-type traps set on leaning poles) where protected plant species typically do not occur (ITP section 2.2.4). Furthermore, trapping is done during the fall when these plants are dormant. None of these plant species is known to occur within the MBPL Seboomook Unit, where ITP mitigation activities will be implemented. Therefore, we find that the proposed action will have no effect on the eastern prairie fringed orchid, Furbish's lousewort, or small whorled pogonia. These species are not considered further in this biological opinion.

New England Cottontail

The New England cottontail (*Sylvilagus transitionalis*) is a medium-sized rabbit that occurs in early successional habitats or thickets in York and Cumberland County Maine. The New England cottontail is listed by Maine as endangered and is a candidate for Federal listing. A final Federal listing determination is expected in 2015.

New England cottontails have undergone a dramatic decline in their numbers and distribution in recent years. There are likely fewer than 200 rabbits in southern Maine (W. Jakubas, MDIFW, pers. comm.). Although New England cottontails have demographic characteristics that enable fast population growth, they occur primarily in small habitat patches where they experience low over-winter survival, primarily caused by predation (Litvaitis and Tash 2006). Deep snow and low survival at small habitat patches have reduced cottontail populations; however, the primary

threat is loss of habitat. Approximately 200 rabbits occur at fewer than 10 locations in southern Maine. There are substantial efforts to create habitat for this species in southern Maine and elsewhere throughout its range.

The MDIFW did not consider take of New England cottontail rabbits in the ITP because the species is not presently listed under the Federal ESA and MDIFW does not have reports of New England cottontail being trapped in foot-hold or killer type traps (Jakubas in litt. 2014). There is no hunting or trapping season for this species in Maine. In 2011, U.S. Department of Agriculture, Wildlife Services caught a New England cottontail in a box trap set in a brushy area adjacent to a beach. This New England cottontail was unharmed and released. Since that time Wildlife Services has established a protocol for trapping in the New England cottontail range which the MDIFW reviewed and approved. No New England cottontails have been caught in Maine since the protocol was established (W. Jakubas, MDIFW, October 20, 2014 memorandum).

Although other species of rabbits and hares are frequently caught in traps (Barrett et al. 1989, Proulx et al. 1989, Mowat et al. 1994, Naylor and Novak 1994, Nocturnal Wildlife Research 2008), a number of factors contribute to an extremely small risk of incidentally trapping New England cottontails in Maine (W. Jakubas, MDIFW, October 20, 2014 memorandum). First, major cottontail population centers on the Sprague Corporation lands in Cape Elizabeth, Rachel Carson National Wildlife Refuge, State parks, and the Wells Estuarine Reserve are closed to trapping. Other populations are within 0.5 mi of densely settled towns or villages, which are also closed to trapping by the MDIFW regulations. Second, the very brushy habitat used by New England cottontail is very difficult to walk through, and, hence, avoided by trappers, especially in light of this habitat's low occurrence in southern Maine. Third, New England cottontails are relatively unsusceptible to capture in sets for trapping furbearers. Cottontails are not generally attracted to the baits (meat) or lures (predator scat and urine) used to trap furbearers, but they could travel along trails used by furbearers and other wildlife. It will be legal to use unlimited size foothold traps in southern Maine after a permit issued and the 2007 consent decree is lifted, and trapper would be expected to use foothold traps to target fox and coyotes, which would be found in cottontail habitat. Killer-type traps would be most likely used along the edge of water bodies for mink and muskrat, but they could be set as blind sets along trails in upland settings. Marten trapping does not occur in southern Maine. The MDIFW has been concerned that trapping pressure in southern Maine is too high in limited areas where trapping is allowed (W. Jakubas, MDIFW, June 24, 2014 pers. comm.).

Predator management activities do not occur within the range of the New England cottontail, though some ADC activities would occur near cottontail populations. The MDIFW has explained that most ADC activities (especially in residential settings) involve cage traps.

We find that the likelihood that New England cottontails will be taken in traps is discountable because trapping is not allowed in areas occupied by many New England cottontail populations. Even though trapping pressure is high in parts of southern Maine, no incidental take of these rabbits have been reported in foothold or killer-type traps. The species would not be expected to be attracted to furbearer sets, but could be trapped if traps are set on trails used by cottontails, especially in dense vegetation. Blind set killer-type traps set low to the ground could take

rabbits. The ITP mitigation activities to be implemented at the MBPL Seboomook Unit will not affect New England cottontails because the species does not occur in vicinity of the mitigation lands. We find that the proposed action is not likely to adversely affect the New England cottontail and, therefore, a conference opinion for this species is not warranted.

Northern Long-Eared Bat

The northern long-eared bat (*Myotis septentrionalis*) was proposed for Federal listing as endangered on October 2, 2013 (78 FR 61046). The Service found that critical habitat for the northern long-eared bat was not determinable at the time of proposed listing. On June 30, 2014, the Service announced a six-month extension on the final listing determination for the northern long-eared bat based on substantial disagreement regarding the sufficiency and accuracy of the available data relevant to this finding. A final decision on the listing must be made no later than April 2, 2015.

The status of the northern long-eared bat is not well known in Maine, but they were in recent years considered a common species in Maine and likely occurred statewide. Their populations are believed to have declined by over 90 percent rangewide in recent years because of a fungal infection known as white-nosed syndrome, but their current status in Maine is unknown.

Northern long-eared bats are not incidentally trapped in Maine. However, the proposed mitigation project for the Canada lynx permit will maintain and enhance 6,220 acres of high quality hare habitat. This may entail forest management activities that may affect bat roost trees and foraging habitat.

The ITP specifies that the MDIFW and the MBPL will develop a forest management plan within three years of permit issuance that provides the specific details on forestry prescriptions, harvest locations, and timeframes that will be implemented. The ITP does not commit to specific measures to avoid adverse effects to northern long-eared bats. These details will be provided in the forest management plan. The Service will review and approve the forest management plan so as to ensure that appropriate conservation measures are incorporated to avoid adverse effects to the northern long-eared bat. If this species is listed as endangered or threatened under the ESA and, for some reason, adverse effects cannot be avoided, the ITP and incidental take permit will need to be amended to address impacts to northern long-eared bats from the mitigation project. Such an amendment would likely be a major amendment requiring re-initiation of the ESA section 7 consultation.

We find that there will be no effects to northern long-eared bat from trapping and that the mitigation project will be implemented in a manner that is not likely to adversely affect northern long-eared bats. Therefore, a conference opinion for this species is not warranted.

Summary

We find that the proposed action, including both trapping activities and implementation of the ITP mitigation activities will have no effect on the eastern cougar or the designated critical habitat for the Atlantic salmon. Adverse effects on the gray wolf, Atlantic salmon, Furbish's

lousewort, small whorled pogonia, and eastern prairie fringed orchid are discountable, and therefore the proposed action is not likely to adversely affect these species. These species are not considered further in this biological opinion.

We also find that the proposed action is not likely to adversely affect New England cottontail and northern long-eared bat. Therefore, conference opinions are not warranted for these species.

Biological Opinion For The Canada Lynx

When evaluating the impacts of a proposed action on federally listed species, we consider the rangewide status of the species, the status of the species within the action area (environmental baseline), and the effects of the action on individuals, populations, and the species as a whole.

Listing History

The contiguous U.S. distinct population segment (DPS) of the Canada lynx was added to the list of threatened species on April 24, 2000 (65 FR 16052). On July 3, 2003, the Service published a clarification of findings in the *Federal Register* (68 FR 40076) determining that threatened species designation was appropriate for the Canada lynx. The boundary of the DPS was revised in a rule published on September 12, 2014 that became effective on October 14, 2014.

Canada lynx critical habitat was designated on November 8, 2006 (71 FR 66008). On February 24, 2009, the Service published a revised critical habitat designation for the Canada lynx (74 FR 8616). A second revised critical habitat designation was published on September 12, 2014, and it became effective on October 14, 2014. Additional information about the critical habitat is provided in a later section of this biological opinion.

Life History, Distribution, Status, And Rangewide Threats

Considerable life history information is provided in the ITP concerning the Canada lynx (section 2.2.1). Additional information on Canada lynx natural history, population dynamics, habitat, distribution, status and factors causing the listing of the Canada lynx is found in the Service's 2000 Final Rule Determining Threatened Status for the Contiguous U.S. Distinct Population Segment of the Lynx (65 FR 16052 and 2003 Notice of Remanded Determination of Status for the Contiguous U.S. Distinct Population of the Lynx (68 FR 40076) and) and is incorporated by reference here. The most current science on the life history and status of the Canada lynx in the coterminous United States was published in 2013 by the Interagency Lynx Biology Team in the 3rd edition of the *Lynx Conservation Assessment and Strategy* (Interagency Lynx Biology Team 2013). The MDIFW summarized information on the biology and status of Canada lynx in Maine in a Canada Lynx Assessment (Vashon et al. 2012). We considered the information contained in these documents in the evaluation of this project, and they are incorporated by reference into this biological opinion.

The historical and present range of the Canada lynx north of the contiguous United States includes Alaska and that part of Canada that extends from the Yukon and Northwest Territories south across the United States border and east to New Brunswick and Nova Scotia. In the contiguous United States, Canada lynx historically occurred in the Cascades Range of

Washington and Oregon; the Rocky Mountain Range in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, northern Utah, and Colorado; the western Great Lakes Region; and the northeastern United States region from Maine southwest to New York (McCord and Cardoza 1982; Quinn and Parker 1987). A thorough discussion and interpretation of historical Canada lynx records is found in the Service's final rule (March 24, 2000, 65 FR 16052) and clarification of our findings (July 2003; 68 FR 40076).

The distribution of Canada lynx in North America is closely associated with the distribution of North American boreal forest (Agee 2000). In Canada and Alaska, Canada lynx inhabit the classic boreal forest ecosystem known as the taiga (McCord and Cardoza 1982; Quinn and Parker 1987; Agee 2000; McKelvey et al. 2000a). The range of Canada lynx extends south from the classic boreal forest zone into the subalpine forest of the western United States, and the boreal/hardwood forest ecotone in the eastern United States (Agee 2000; McKelvey et al. 2000a, Hoving 2001). Forests with boreal features (Agee 2000) extend south into the contiguous United States along the Cascade and Rocky Mountain Ranges in the west, the western Great Lakes Region, and along the Appalachian Mountain Range of the northeastern United States. Within these general forest types, Canada lynx are most likely to persist in areas that receive deep snow, to which the Canada lynx is highly adapted (Ruggiero et al. 2000a). Canada lynx are rare or absent from the wet coastal forests of Alaska and Canada (Mowat et al. 2000).

At its southern margins in the contiguous United States, forests with boreal features, or southern boreal forests, become naturally fragmented as they transition into other vegetation types. Southern boreal forest habitat patches are small relative to the extensive northern boreal forest of Canada and Alaska, which constitutes the majority of Canada lynx range. Many southern boreal forest habitat patches within the contiguous United States cannot support resident populations of Canada lynx and their primary prey species.

The complexities of Canada lynx life-history and population dynamics, combined with a general lack of reliable population data for the contiguous United States, make it difficult to ascertain the past or present population status of Canada lynx in the contiguous United States. It is difficult to determine with certainty whether reports of Canada lynx in many states were (1) animals dispersing from northern populations, (2) animals that were a part of a resident population that persisted for many generations, or (3) a mixture of both resident and dispersing animals.

The final rule determining threatened status for the Canada lynx DPS in the contiguous United States summarized Canada lynx status and distribution across four regions that are separated from each other by ecological barriers consisting of large geographic areas lacking Canada lynx habitat (March 24, 2000, 65 FR 16052). The distinct regions of boreal forest that support Canada lynx in the contiguous United States are the Northeast, the Great Lakes, the Northern Rocky Mountains/Cascades, and the Southern Rocky Mountains. The 2005 recovery outline for the species split these regions into six "core" areas for Canada lynx, with the southern Rocky Mountains area designated as an additional "provisional core" area (USFWS 2005). While these regions are ecologically unique and discrete, the Canada lynx is associated with only the southern boreal forest in each and, with the exception of the Southern Rocky Mountains Region, the habitat in each area is geographically connected to the much larger population of Canada lynx in Canada.

In the 2000 final listing, the Service concluded that the single factor warranting ESA protection for the contiguous U.S. DPS of Canada lynx was the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of Canada lynx in National Forest Land and Resource Management Plans and Bureau of Land Management Land Use Plans. In subsequent critical habitat documents, the Service has acknowledged the inadequacy of existing regulatory mechanisms, specifically lack of forest planning on private lands in the Northeast, and climate change as a factor threatening Canada lynx.

Environmental Baseline

Regulations implementing the ESA (50 CFR 402.02) define the "environmental baseline" as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects (in the action area) that have undergone section 7 consultation and the impacts of State and private actions that are contemporaneous with the consultation in progress.

The action area for the proposed action is all lands where trapping may be legally permitted in the State of Maine. Notwithstanding the occasional long-distance dispersal of Canada lynx (Mowat et al. 2000, McKelvey et al. 2000), however, Canada lynx snow track surveys (Simons 2009, Vashon et al. 2012), and habitat modeling (Hoving 2001, Simons 2009) document a six million acre region of northern Maine constituting the primary range of the Canada lynx within the State (see Figure 4.2.1. of the DEA). Hence, this is portion of the action area that is pertinent to Canada lynx.

Canada Lynx Habitat Conditions And Abundance In The Action Area

The primary factor driving Canada lynx behavior, habitat use, abundance, and distribution is the abundance of snowshoe hare, their primary prey. Snowshoe hares prefer boreal forest stands that have a dense horizontal understory to provide food, cover, and security from predators. Snowshoe hares feed on conifers, deciduous trees, and shrubs (Hodges 2000). Snowshoe hare density is correlated to understory (horizontal) cover between approximately 3 to 10 feet above the ground or snow level (Hodges 2000). Habitats most heavily used by snowshoe hares are stands with shrubs, stands that are densely stocked, and stands at ages where branches have more lateral cover (Hodges 2000). Generally, earlier successional forest stages support a greater density of horizontal understory and more abundant snowshoe hares (Buehler and Keith 1982; Wolfe et al. 1982; Koehler 1990; Hodges 2000b; Homyack 2003; Griffin 2004, Scott 2009). In the West, mature, multistoried stands also can have adequate dense understory to support abundant snowshoe hares (Hodges 2000a; Hodges 2000b; Griffin 2004, Squires et al. 2006). In Maine, dense regenerating spruce and fir stands approximately 15 to 35 years after a stand-replacing disturbance (clearcut, heavy shelterwood harvest) provide the dense cover preferred by hares and Canada lynx (Fuller et al. 2007, Vashon et al. 2008, Scott 2009, Simons 2009).

Increases in Maine's Canada lynx population throughout the 1990s and early 2000s were the result of regenerating forest conditions created by extensive clearcuts treated with herbicides to preemptively cut and salvage softwood forest damaged caused by a spruce budworm (*Choristomneura fumiferana*) outbreak in the 1970s and 1980s (Homyack 2003, Hoving et al.

2004, Fuller 2006, Vashon et al. 2008b). In addition, substantial areas of northern Maine experience deep snow (Hoving et al. 2005), which Canada lynx are physically adapted to travel on and which provide a competitive advantage (Krohn et al. 2004, Hoving et al. 2005) over potentially competing carnivores (e.g., fisher and bobcats).

Silviculture in northern Maine substantially changed as a result of the Maine Forest Practices Act (1989). In the decade following passage, the total annual acreage harvested from commercial forestlands increased from roughly 250,000 acres to roughly 500,000 acres and the percentage of clearcut acreage declined from 40 percent to 4 percent. Partial harvesting largely replaced clearcutting. Many forms of partial harvesting result in greatly reduced landscape hare densities (Robinson 2006, Scott 2009). Regenerating spruce/fir saplings stands that support snowshoe hare and Canada lynx increased in Maine since 1985 and may have peaked in 2007 (Simons 2009, chapter 4). Although Maine's historic Canada lynx population was sometimes abundant (Hoving et al. 2003), the current inventory of spruce/fir sapling forest and the snowshoe hare and Canada lynx populations that they support are probably at the highest levels observed in the last century (McWilliams et al. 2005, Hoving et al. 2004, Vashon et al. 2012).

Maine's Canada lynx population is expected to decline in response to a maturing forest and associated decline in amount and quality of hare habitat (Simons 2009). Under several silvicultural scenarios, the habitat for Canada lynx is expected to decline over the next 18 years (Simons 2009, chapter 4). The majority of Canada lynx habitat in Maine is also projected to shift southward due to forest practices, where Canada lynx experience greater competition with bobcats and fisher and may be at greater risk from declining snowfall as a result of climate change. Canada lynx populations are projected to decline by 65 percent by 2032 if current silviculture trends continue (i.e., prevalent partial harvesting). Even under the best scenarios (maximum clearcutting allowed) Canada lynx density may decline by 55 percent by 2032 (Simons 2009). Despite these declines, there will still be more habitat present in 2032 than occurred in Maine in the 1970s and 1980s (Simons 2009) and a smaller population of Canada lynx is expected to persist.

Canada lynx populations are affected by fluctuations and cycles in hare populations. From the mid-1990s until 2006, snowshoe hare densities in optimal, regenerating conifer habitat remained relatively stable and ranged from 0.7 to 0.9 hare per acre (Fuller and Harrison 2005, Scott 2009). From 2007 until 2012, hare densities in Maine and southern Quebec declined across all forest stand types and ranged from 0.3 to 0.5 hare per acre in optimal regenerating conifer habitat (Scott 2009, Assels et al. 2007, D. Harrison, University of Maine, unpublished data). Whether this represented a stochastic or natural fluctuation or attenuated hare cycle is unknown. To accommodate lower hare densities, landscapes needed to support Canada lynx home ranges in Maine may need to be considerably larger in the future, and in some areas landscape hare density may decline to a point no longer able to support Canada lynx (Scott 2009). During the recent hare decline, Maine Canada lynx exhibited some of the same characteristics of cyclic populations in central Canada and Alaska including greatly reduced reproduction on the Clayton Lake study area from 2006 to 2009 (Vashon et al. 2012, table 1.2). When hare populations began to rebound (D. Harrison, University of Maine, unpublished data) all radio-tagged female Canada lynx produced young in spring 2010 and there was evidence of high survival rates of the kittens (Vashon et al. 2012, Mallett 2014).

Hare density affects home range and movements of Canada lynx. Canada lynx typically increase their home range size dramatically following declines in the hare cycle (Ward and Krebs 1985, Slough and Mowat 1996, O'Donaghue et al. 2001). However, Maine median annual Canada lynx home ranges (males: 23.5 mi^2 at high hare densities and 14 mi^2 at low; females: 12 mi^2 at high hare densities and 9.6 mi^2 at low) did not change significantly between high and low periods of hare density perhaps because hare densities may not have reached low enough levels to require Canada lynx to respond spatially (Mallett 2014). In Montana where hare densities are lower (0.2 hare per acre in optimal habitat; Griffin 2004), annual Canada lynx home ranges (77 mi^2 males; 34.7 mi^2 females, Squires and Laurion 2000) are three to four times the size of average annual home ranges in Maine where hare densities are four times higher.

Hare abundance has been shown to exert strong effects on Canada lynx fecundity and survival of kittens. Slough and Mowat (1996) reported yearling females giving birth during periods when hares were abundant. During the low phase of the hare cycle in Alaska and Canada, few if any live kittens are born, and few yearling females conceive (Brand and Keith 1979; Poole 1994; Slough and Mowat 1996). In Alaska and Canada, during periods of hare abundance litter size of adult females averaged four to five kittens (Mowat et al. 1996). Some Canada lynx recruitment occurs when hares are scarce (Mowat et al. 2000). This limited reproduction is important in maintaining Canada lynx populations during hare lows. In Maine during periods of high hare populations, 80 to 100 percent of females produced litters that averaged 2.7 kittens. During a period of low hare populations, 14 percent of females produced litters of only one or two kittens (Vashon et al. 2012).

By utilizing two different methods, the MDIFW estimated that there were between 750 and 1,000 adult Canada lynx in northern Maine in 2006 (ITP section 2.2.1; Vashon et al. 2012, appendix IV) about the time when the MDIFW believed that Canada lynx populations peaked (Vashon et al. 2012). Simons (2009) used a Canada lynx habitat model and calculated the summed probability of Canada lynx occurrence using a fixed, non-overlapping home range-sized grid to estimate a population of approximately 236 to 355 adult Canada lynx on a 3.56 million acre study area (160 townships) that comprised about half of the 6.5 million acre Canada lynx critical habitat. Both methods have shortcomings, but indicate that northern Maine supports a population of more than 500 adult Canada lynx. For the purposes of this biological opinion, we will rely on a minimum population estimate of 500 adult Canada lynx in Maine, although the actual population may well be higher[3]. As noted above, abundance of Canada lynx in the action area are expected to decline over the life of the proposed action (because of changes in forest management practices that affect habitat suitability and declining habitat), but the extent and timing of effects on Canada lynx numbers is uncertain.

Anticipated Effects Of Climate Change On Canada Lynx In The Action Area

Recent Service designations of critical habitat have identified climate change as a factor threatening Canada lynx (74 FR 8616, 79 FR 54782). Anticipated changes in climate have been

[3] See *Effects of incidental take to Canada lynx in Maine* (EA section 5.1.1.1) for discussion of how the population size affects the amount of expected take. See also *Amount of Capture, Injury, and Mortality from Trapping* on page 22 of this biological opinion.

characterized at the global, national, regional and local level and are expected to continue into the future (Karl et al. 2009). For purposes of this biological opinion we assume that trends in climate changes will continue, however, over the 15-year permit term we are uncertain whether the rate of change will be significant enough to cause changes in precipitation or temperature that would affect Canada lynx, their habitat, or prey (snowshoe hares).

Canada lynx distribution and its habitat, i.e. denning, cover, and forages species habitat, in Maine is closely associated with the distribution of sub-boreal spruce-fir forests (Hoving et al. 2005, Vashon et al. 2008, Simons 2009, Scott 2009, Vashon et al. 2012). The dependence of Canada lynx on winter snow and boreal forest renders the species vulnerable to climate change (Jacobson et al. 2009, Gonzalez et al. 2007). Based on modeled decreases in snow cover and a northward shift in the distribution of boreal forest, Gonzalez et al. (2007) found that potential Canada lynx habitat could decrease by approximately 60 percent in the lower 48 states by the year 2100, including the loss of almost all potential Canada lynx habitat in Maine. That is, as temperatures rise with global warming, the snowpack and forests that Canada lynx rely on are predicted to move upward in altitude and northward in latitude (Gonzalez et al. 2007).

Furthermore, past climate changes in Maine have resulted in very different forest composition and will affect the State's future forest. Research on Maine lake sediments indicate that between 5,000 and 9,000 years ago, temperatures were as much as 4°F warmer and the climate was considerably drier than today. Softwood composition at that time was mostly white pine and hemlock (Davis et al. 1980). Spruce did not occur in Maine until just 500 years ago, which was associated with summer cooling during the "Little Ice Age" (1450 – 1850 AD). Although coastal cooling may allow spruce-fir forests to remain along the Maine coast, these species are expected to decline significantly in northern Maine during the next 100 years (Prasad et al. 2007, Iverson et al. 2008, Ollinger et al. 2008, Tang and Beckage 2010). Forest management and other disturbance (e.g. budworm) may hasten forest change from softwood to hardwood in northern Maine, and this trend has already been observed (Simons 2009). Northern Maine's spruce-fir forest would likely be replaced by an expanding oak – pine forest and northern hardwoods (Iverson et al. 2008) that are unlikely to support Canada lynx.

Winter conditions that provide deep fluffy snow for extended periods of time have been identified as an important characteristic of Canada lynx habitat (USFWS 2014). Gonzalez et al. (2007) found that Canada lynx require nearly continuous snow cover for four months (December through March), and at least a 75 percent probability of snow in January for a 5 percent probability of finding Canada lynx, and a 100 percent probability of snow in January for a 95 percent probability of finding Canada lynx. Thus, anticipated changes in climate, i.e. temperature increases that result in a decrease in snow cover, snow depth, or longevity of snow cover could decrease the presence of Canada lynx habitat at lower elevations. Although fine-scale climate models are not yet available for northern Maine, if snow levels drop below 270 cm per year, Canada lynx may no longer have a competitive advantage over bobcats (Hoving et al. 2005, Carrol 2007).

Warming temperatures and decreasing precipitation are also likely to cause larger and more frequent insect outbreaks, as well as increased frequency of forest fires. While insect outbreaks may result in more woody debris, creating more potential for den sites, the downed wood will

add more fuel for the increasing wild fires that are predicted to occur. Wildfire in Maine northern spruce-fir forests is relatively infrequent in Maine (as compared to similar Midwestern and Western forests), but large, stand-replacing fires have occurred in the historic past (Lorimer and White 2003).

While changes in the fire regime associated with climate change may decrease denning habitat, in some areas, these conditions may increase the availability of suitable foraging habitat for Canada lynx. In areas characterized by low-frequency, high-intensity wildfire, an increase in fire frequency could possibly lead to a greater abundance of brushy, early successional habitat (foraging habitat) (McKenzie et al. 2004). Canada lynx foraging habitat includes areas where snowshoe hare densities are likely to be greatest. Snowshoe hares inhabit various successional stages and vegetation communities; however, they appear to prefer stands (young or older) that possess dense conifer or conifer and shrub understory vegetation (Hodges 1999).

Both timber harvest and natural disturbance processes, including fire, insect infestations, catastrophic wind events, and disease outbreaks, can provide foraging habitat for Canada lynx when resulting understory stem densities and structure provide the forage and cover needs of snowshoe hare (Keith and Surrendi 1971; Fox 1978; Conroy et al. 1979; Wolff 1980; Parker et al. 1983; Litvaitis et al. 1985; Bailey et al. 1986; Monthey 1986; Koehler 1990; Agee 2000, Simons 2009, Scott 2009). Thus, timber harvest may provide foraging habitat while concurrently reducing carbon sequestration capabilities of the forest, adding to greenhouse gas emissions.

Decreased snowfall may affect Canada lynx through decreased prey vulnerability and decreased competitive advantage over sympatric carnivores in the northern Appalachian Mountains (Carroll 2007). Based on predicted decreases in snowfall, climate change influenced modeled declines in lowland populations of Canada lynx, which suggests that contraction may occur in the core of their current regional range as well as among smaller peripheral populations.

Other authors have suggested that Canada lynx prey may become more vulnerable to predation as a result of climate change, with potentially beneficial results for Canada lynx. Schmitz et al. (2003) speculated that environmental warming that produces anomalously warm temperatures and little snowfall may lead to more efficient predation by Canada lynx, possibly resulting in a chronic decline in snowshoe hare abundance. Mills et al. (2013) indicated that the timing of when hares have their winter coat may no longer match the timing or duration of the winter snow pack, rendering the hares more susceptible to predation.

Anticipated changes to Maine's climate are likely to significantly affect the distribution and abundance of wildlife and their habitats over the long term (decades) (Jacobson et al. 2009, Whitman et al. 2010), but we anticipate relatively minor changes during the 15-year duration of the proposed action. For example, over the next century climate change is expected to reduce spruce-fir habitat, which could reduce the range of Canada lynx, marten, and other boreal furbearer species; reduce snowfall, which could favor temperate furbearer species like bobcat, fisher, gray fox, and opossum. We expect shifts in Canada lynx and snowshoe hare populations and their habitat are likely to occur incrementally over many decades or within the next 100

years (Jacobsen et al. 2009, Whitman et al. 2010), but the nature, magnitude, geographic distribution, and timing of these changes is uncertain.
In summary, Canada lynx are specialized carnivores whose habitat requirements in Maine are closely tied to sub-boreal spruce-fir forests. Canada lynx require a matrix of forest characteristics that provide cover habitat, horizontal structure, i.e. down woody debris, continuous snow cover for extended periods of time, and prey species habitat. It is difficult to accurately predict when this specialized species will respond to anticipated environmental changes associated with climate change. We anticipate that eventually changing snow conditions will move Canada lynx distribution upward in elevation (which is limited in Maine) and northward in latitude. Such a habitat shift is likely to reduce the aerial extent and distribution of Canada lynx habitat in the action area. However, the scope, scale, and timing of such changes are uncertain, and the effects (positive or negative) on Canada lynx may be variable across the landscape.

Other Factors Affecting Canada Lynx In The Action Area

Other factors affecting Canada lynx in Maine include predation and competition from other wildlife species, vehicle collisions and roads as barriers to Canada lynx movements, shooting, and trapping.

Predation Of Canada Lynx By Other Wildlife Species

Across their range predation on Canada lynx by fisher (*Martes pennant)*, mountain lion[4] (*Puma concolor*), coyote (*Canis latrans*), wolverine (*Gulo gulo*), gray wolf, and other Canada lynx has been confirmed (Berrie 1974; Koehler et al. 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997; Apps 2000; Squires and Laurion 2000; Squires et al. 2006, Vashon et al. 2012). Fourteen of 18 radio-tagged Canada lynx that died from predation in Maine between 1999 and 2011 were killed by fishers and the remaining 4 were of unknown causes (Vashon et al. 2012). Nine other radio-tagged Canada lynx mortalities in Maine between 1999 and 2011 were suspected to be caused by fisher predation (ITP Table 2.3, Vashon et al. 2012). Despite the abundance of coyotes in northern Maine, they do not seem to be an important source of Canada lynx mortality (Vashon et al. 2012).

Disease And Parasites

Disease and parasites in Canada lynx have not been well documented. Canada lynx have antibodies for feline parvovirus in all areas samples in western North America (Biek et al. 2002). In Maine, Canada lynx have been documented with lungworm (*Troglostrongylus wilsoni*), a nematode that can debilitate Canada lynx when infestations are severe. Some starvation losses in Maine are likely associated with infestations of lungworm that may compromise respiration and the ability of Canada lynx to chase and catch their prey (Dr. J. Weber, Univ. of Maine pathologist, pers. comm. in Vashon et al. 2012).

[4] These incidents occurred outside Maine and, hence, did not involve the extinct eastern cougar subspecies.

Starvation

Starvation is the most commonly reported cause of mortality in Canada lynx, especially in kittens (Quinn and Parker 1987, Koehler 1990, Vashon et al. 2012. In Maine, 26 percent (17 of 65) of the mortalities of radio-tagged Canada lynx were from starvation, even during times when hare populations were high (Vashon et al. 2012). This suggests that other sources may contribute to mortality (e.g., undetected disease and parasites, injury). In cyclic Canada lynx populations of the northern boreal forest, most natural Canada lynx deaths are attributed to starvation during the years of low hare abundance (Poole 1994, Slough and Mowat 1996). Hunger-related stress is also thought to induce dispersal, which may increase the exposure of Canada lynx to other forms of mortality such as trapping and highway collisions (Brand and Keith 1979, Carbyn and Patriquin 1983, Ward and Krebs 1985, Bailey et al. 1986, Interagency Lynx Biology Team 2013).

Competition Between Canada Lynx And Other Wildlife Species

Other wildlife predators compete with Canada lynx via competition for food and behavioral interference. For example, many predators (birds of prey, coyote, red fox, pine marten, weasels, fisher, bobcat (and gray wolf, wolverine, and puma elsewhere in their range)) consume snowshoe hares and therefore, compete at some level with Canada lynx for prey. Canada lynx have adaptations for surviving in areas that have cold winters with deep, fluffy snow for extended periods; these adaptations provide Canada lynx a competitive advantage in hunting snowshoe hare over many potential competitors, such as bobcats or coyotes (McCord and Cardoza 1982; Buskirk et al. 2000; Ruediger et al. 2000; Ruggiero et al. 2000a). Long-term snow conditions presumably limit the winter distribution of potential Canada lynx competitors such as bobcats (McCord and Cardoza 1982) or coyotes. Further, bobcats, fishers, and coyotes have a higher foot load (more weight per surface area of foot), which causes them to sink into the snow more than Canada lynx. Therefore, bobcats, fishers and coyotes cannot efficiently hunt in fluffy or deep snow and are at a competitive disadvantage to Canada lynx.

Buskirk et al. 2000 theorized coyotes posed local or regionally important competition for snowshoe hare and that coyotes and bobcats might impart important behavioral interference effects on Canada lynx. Based on only anecdotal evidence, Parker et al. (1983) discussed competition between bobcats and Canada lynx on Cape Breton Island. Canada lynx were found to be common over much of the island prior to bobcat colonization. Concurrent with the colonization of the island by bobcats, Canada lynx densities declined, and their presence on the island became restricted to the highlands, the one area where bobcats did not become established. Bobcats seem to exclude Canada lynx from the highest quality habitat in Maine where their ranges overlap (Robinson 2006). Modeled Canada lynx range in the Northeast U.S. and eastern Canada is generally disjunct from the range of the bobcat (Robinson 2006, Simons 2009), but there is a zone of overlap and hybrid bobcat- Canada lynx have been observed (Schwartz et al. 2002), including in Maine (Homyack et al. 2008).

It has been hypothesized that snowmobiles may allow Canada lynx competitors (e.g., coyotes) into deep snow habitats where Canada lynx forage in winter causing impacts via interspecific competition (Buskirk et al. 2000). Several studies show that coyotes use compacted snow trails,

but none indicate increased competition or substantial dietary overlap between Canada lynx and coyotes (Interagency Lynx Biology Team 2013). However, research in the Northern Rockies has provided little evidence supporting the contention that coyote use of snow-compacted routes adversely affected Canada lynx or their habitats. Squires et al. (2010) reported no evidence that Canada lynx were sensitive to forest roads, including those used by snowmobiles in winter. Kolbe et al. (2007) also found little evidence that coyotes more efficiently compete with Canada lynx in the presence of packed snowmobile trails. Kolbe et al. (2007) observed that snowshoe hares made up a small portion of coyote feeding sites (three percent) in the winter, and that coyotes primarily used packed trails to access and scavenge ungulate carrion. As noted above, coyotes do not seem to be an important source of competition or mortality for Canada lynx in Maine (Vashon et al. 2012).

Vehicle Collisions

Between 2000 and 2012, 32 Canada lynx were reported killed on roads (both paved and unpaved) in Maine (ITP section 4.1).

Trapping And Shooting

Directed trapping of Canada lynx is illegal in Maine, so trapping of Canada lynx (except for authorized research) is incidental to trapping of other species. In Maine, 84 Canada lynx were reported or otherwise discovered to be caught in traps set for other furbearers from 1999 to 2013, of which five were reported mortalities (ITP Tables 4.1.3 and 4.1.4, MDIFW unpub. data from 2013 trapping season). During the same time period, seven Canada lynx were shot illegally, including two Canada lynx shot by a hunter while in a trap (Vashon et al. 2012). Seven Canada lynx radio-tagged in Maine between 1999 and 2011 were trapped or snared in Quebec where trapping Canada lynx is a legal activity, and three were killed from illegal means (ITP Table 2.3).

Synergistic Factors

Some factors described above may interact synergistically to affect Canada lynx. For example, deterioration of habitat conditions that favor abundance of snowshoe hare may contribute to hunger-related stress that induces Canada lynx dispersal. In turn, this may increase the exposure of Canada lynx to other forms of mortality such as trapping and highway collisions (Brand and Keith 1979; Carbyn and Patriquin 1983; Ward and Krebs 1985; Bailey et al. 1986). Climate may affect the prevalence and distribution of parasite and disease vectors, which in turn could affect the health of Canada lynx, increasing starvation and other sources of mortality.

Prior Federal Projects In The Action Area That Have Undergone Section 7 Consultation

In 2001 the Service completed a formal biological opinion on the effects of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Export Program for appendix II furbearer species on the contiguous U.S. DPS of the Canada lynx pursuant to section 7(a)(2) of the ESA. The 2001 biological opinion concluded that the export of bobcat pelts over 10 years was not likely to jeopardize the Canada lynx, and provided an exemption for the

prohibition against take for two Canada lynx mortalities and two Canada lynx injuries annually in the United States from trapping and hunting activities specifically targeting bobcat (USFWS 2001). In 2012, the Service formally modified the 2001 biological opinion, extending its term indefinitely and noting that actual take during the first 10.5 years of the program has totaled eight Canada lynx captured (no more than two annually), all released unharmed (USFWS 2012). Up to this time, there has been little overlap between effects anticipated in the biological opinion for the CITES program and the MDIFW's ITP for Canada lynx because there have been no reported Canada lynx incidentally trapped in traps set specifically for bobcats. All Canada lynx reported caught have been caught in traps intended for fox, coyote, marten, fisher, and other species. Furthermore, there is little targeted bobcat trapping in the MDIFW's wildlife management districts (WMDs) where Canada lynx occur (ITP section 3.2)[5]. For example, there is no bobcat harvest in the most northerly WMDs and low harvest in others (ITP table 3.1.2, p. 45). The average harvest of bobcats in Canada lynx WMDs is 112 animals. This includes 87 bobcats caught in WMDs 7, 11, 18 and 19, which provide good bobcat habitat, but have few Canada lynx. Unless it is well-documented that a trapper was targeting bobcats only, all incidental take in traps in Maine will count toward the take authorized under the MDIFW's permit.

A 2006 programmatic consultation for the Natural Resources Conservation Service's (NRCS) Healthy Forest Reserve Program (HFRP) concluded that enrollment of tribal and private lands within the range of the Canada lynx in Maine that provides technical and financial assistance for the development of forest management plans based on the Service's "Canada Lynx Habitat Management Guidelines for Maine" would provide a net conservation benefit for Canada lynx, to be documented in individual Habitat Restoration Plans to be developed for each enrolled property. These plans must be reviewed and approved by NRCS with assistance from the Service, and subject to separate biological opinions tiered under the programmatic biological opinion. Plans must be developed for a 70-year forest rotation and provide a decade-by-decade assessment of the location and -anticipated condition of Canada lynx habitat on the ownership. A low level of take may occur in the course of forest management to benefit Canada lynx or in the unlikely event that landowners exercise safe harbor provisions that allow them to return their habitat to baseline conditions (USFWS 2006). Current enrollment in the program covers four landownerships totaling 943.2 square miles. Little or no lethal take is expected with forestry operations associated with creating Canada lynx habitat (although this is possible), and the outcome of the HFRP is expected to improve the overall habitat conditions for Canada lynx.

In 2007, the Service issued a biological opinion to the Federal Highways Administration for the reconstruction and widening of 5.23 miles of Route 161 in Aroostook County. The biological opinion concluded that this project was not likely to jeopardize the continued existence of the contiguous U.S. DPS of Canada lynx or destroy or adversely modify its designated critical habitat. The incidental take statement anticipated mortality of one Canada lynx as frequently as every three years, or three Canada lynx every nine years, on the reconstructed section of Route 161 (USFWS 2006).

[5] The MDIFW anticipates that after a permit is issued, trappers will use cage traps to specifically target bobcats in Canada lynx WMDs (ITP section 3.2).

Synthesis

The best available information shows that the primary factor driving Canada lynx abundance and distribution in the action area is the abundance of snowshoe hare, their primary prey. Snowshoe hare density is, in turn, determined by the quantity and quality of boreal forest stands that have a dense horizontal understory, conditions that are generally found in un-thinned forests that are approximately 15 to 35 years old. Climate change may affect Canada lynx via effects on the distribution of boreal forest and areas of persistent deep fluffy snow, as well as other more subtle paths such as incidents of fire and insect outbreaks, incidence of disease and parasites, and indirect effects on abundance of other wildlife that preys on Canada lynx; the scope and scale of such changes are uncertain, however, and the effects (positive or negative) on Canada lynx may be variable across the landscape. Predation by other wildlife species, competition with other wildlife species, vehicle collisions, trapping, and shooting are much less influential factors affecting Canada lynx in the action area. Prior section 7 consultations in the action area anticipated low adverse effects or net conservation benefits.

Effects Of The Proposed Action On Canada Lynx

In the sections below, we consider effects of trapping activities; effects due to incidental trapping of snowshoe hares, trapper use of snowmobiles, and trappers driving on forest roads; and effects of the proposed mitigation.

Effects Of Trapping Activities On Canada Lynx

Amount Of Capture, Injury, And Mortality From Trapping

The proposed action would authorize incidental capture of up to 195 incidentally trapped Canada lynx over a 15-year permit period. Over the life of the permit, up to three Canada lynx may be killed or have injuries severe enough that they cannot be fully rehabilitated and subsequently released; up to nine may be severely injured but released following rehabilitation; and the remainder (i.e., 183 Canada lynx) will be released with minor injuries. This take request includes a 20 percent buffer above captures projected on the basis of past experience and available data. Via contingencies described in the changed circumstances section of the ITP, the proposed action provides the potential for additional or modified measures to minimize the amount of take (e.g., rate of incidental captures, rate of severe injuries, and rate of mortalities) during the life of the permit. However, the amount of authorized take cannot be increased without a permit amendment that would also trigger reinitiation of consultation.

Beyond the amount of take authorized, other factors related to the proposed action that might influence the effects on Canada lynx include: (1) unreported Canada lynx capture events, (2) accuracy of injury assessments, (3) uncertainty about post-release effects on Canada lynx survival and reproduction, (4) undetected effects on kittens if their mother is captured, and (5) captures, injuries, or mortalities that occur in illegal sets. Each of these factors is discussed in more detail below.

(1) **Reporting of Canada lynx capture events:** Since 2008, the MDIFW trapping regulations require trappers to report any captures of Canada lynx "as soon as possible and prior to

removing the animal from the trap" and within 24 hours if the Canada lynx was released by the trapper. A reporting hotline has been established and trappers are given commendations by the Commissioner for properly reporting. Of particular concern would be unreported incidental take in killer-type traps that would cause death or severe injury. To further address the potential for non-reporting of incidental Canada lynx captures in killer-type traps, the ITP provides for increased compliance monitoring (warden checks of 80 trappers in Canada lynx WMDs annually), which will increase the incentive for reporting Canada lynx captures. In addition, by having incidental take coverage for the program, there could be less incentive not to report these incidental captures, since the capture events will not result in ESA section 9 violations. Conversely, trappers may be reluctant to report lethal take or severe injuries that would trigger some changed circumstances and their associated contingencies.

The MDIFW does not think that Canada lynx capture events are under-reported to any significant extent and provides evidence that none of the 74 radio-tagged Canada lynx in their 12-year telemetry study were caught in killer-type traps (although some were caught and reported in foothold traps (ITP section 3.2). We cannot rule out the possibility of unreported captures. However, for the purposes of this biological opinion we conclude that unreported take is likely to be low and that unreported take in killer-type traps will be further reduced by increased compliance monitoring under the ITP.

One line of reasoning holds that unreported take could occur absent the MDIFW's trapping program. An alternative interpretation is that failure to report is more likely than Canada lynx capture in the absence of a trapping program. Under the latter interpretation, the effect of unreported take could be construed an indirect effect of the proposed action, while the first interpretation would make it a cumulative effect, as defined under 50 CFR 402.02 (i.e., a private action that is reasonably certain to occur in the action area considered in this biological opinion). The biological impact on the species is the same whether it is defined as an indirect effect or a cumulative effect.

Although unreported take is part of the authorized take and covered under the proposed action[6], we have considered the biological impact of unreported serious injury or mortality in our analysis of effects of capture, injury, and mortality from trapping on the Canada lynx population (see *Synthesis*, below).

(2) **Accuracy of injury assessments:** Over the life of the permit, the MDIFW indicates that up to nine Canada lynx may be severely injured but released following rehabilitation; and the remainder (i.e., 183 Canada lynx) will be released with no or only minor injuries (ITP section 4.2). The effects of these injuries are dependent, in part, on the accuracy of injury assessments.

[6] See ITP section 3.3 for examples of illegal activities (including non-reporting) that may, or may not count toward the authorized take or trigger changed circumstances. The MDIFW provided an example of a trapper who fails to report a capture and the Canada lynx subsequently dies or sustains a severe injury due to the capture event. The capture would count towards the MDIFW take allocation for capture events, but the injury or death would not count toward the severe injury allocation (or trigger the changed circumstances regarding death or injury). Capture events resulting from violations of state law (e.g., not reporting) will be independently evaluated for concurrence by the Service within 30 days of receiving the final report. Disputes will be resolved at an annual meeting between the MDIFW and the Service.

Without killing and conducting post-mortem injury assessment (i.e., necropsies), it is difficult to detect some trap-related injuries (e.g., the more serious injuries such as luxation, fractures, bone abrasion, capture myopathy, mild freezing) in a field setting. Trapping studies have used several different injury scoring systems to categorize and quantify the extent of injury incurred by a trapped animal. A standard trauma scoring system was developed by the International Organization for Standardization (ISO; Standard 10990-5:1999, www.iso.org, Harris et al. 2006). Engeman et al. (1997) found that inconsistent assessment of trap injury occurred, even among an international panel of veterinary pathologists highly experienced with trap injuries. With training and experience, wildlife biologists may be able to improve their ability to detect, diagnose, and score injuries (Engeman et al. 1997).

The MDIFW has incorporated a number of elements into the ITP to ensure that their trapping related survival and injury information is as robust as possible, while considering appropriate tradeoffs with the risk of stress related to delaying release of captured Canada lynx, immobilization, and/or transportation. Measures to assure accurate injury assessment include having adequately trained wildlife biologists respond to Canada lynx capture events and assess the potential for injuries prior to release; developing an updated field based injury assessment system with veterinary assistance; and having veterinarians periodically evaluate the effectiveness of injury evaluations. We believe these practices will maximize the accuracy of injury assessments. However, we recognize that actual injuries may sometimes be either more or less severe than indicated by assessments and that some Canada lynx will be unintentionally released with undetected, severe injuries that could affect their subsequent survival and reproduction. On balance, however, we believe that the accuracy of injury assessments is good and will improve under the ITP.

(3) **Uncertainty about post-release effects on Canada lynx survival and reproduction:** Trapping, chemical immobilization, and handling of wild animals have been documented to cause detrimental effects to some wildlife species (Beringer et al. 1996, Cattet et al. 2008, Williams and Thorne 1996) but not others (Delgiudice et al. 1986, Johannesen et al. 1997). Post-release effects for wildlife include decreased survival (White et al. 1972), reproduction (Ballard and Tobey 1981), abandonment of offspring (Cote et al. 1998), and increased predation on captured animals (Bro et al. 1999).

The MDIFW assessed information collected from Canada lynx caught in padded foothold traps and cage traps for their12-year telemetry study, to conclude that trapping had little effect on post-release survival of Canada lynx that had no, or only minor, apparent injuries (ITP section 4.1). The MDIFW's study tried to account for undetected serious injuries by waiting a month before measuring survival of their radio-tagged Canada lynx. Ultimately, based on their study results, the MDIFW does not believe undetected injuries are likely to affect Canada lynx survival or reproduction after capture, since most females survived and gave birth to kittens (ITP section 4.1).

For severely injured Canada lynx (not to exceed nine animals over the life of the permit) that are rehabilitated and released, the MDIFW will monitor survival related effects through radio transmitters. For the purposes of this biological opinion, we assume that the post-release survival and reproduction of seriously injured Canada lynx could be moderately reduced (see

Synthesis, below), but that there will be insignificant short or long-term post-release impairment of Canada lynx that are deemed uninjured or to have sustained minor injuries.

(4) **Undetected effects on kittens if they or their mother is captured:** Young Canada lynx typically stay with their mothers for nearly their first year of life. During the MDIFW's 12-year Canada lynx radio-telemetry study, only one kitten was trapped in 122 Canada lynx captures. The MDIFW determined the age of 36 Canada lynx incidentally trapped by fur trappers (ITP table 4.1.3); 3 (8 percent) were kittens, 7 (20 percent) were sub-adults, and 26 (72 percent) were adults. Females that were trapped, radio-tagged, and that were traveling with kittens always reunited with their kittens (Vashon et al. 2012). Similarly, the kitten that was trapped and released was able to reunite with its mother. Therefore, the MDIFW does not anticipate any kitten mortalities resulting from adult females or kittens being incidentally caught in foothold traps and subsequently released.

In addition to being directly caught in traps, kittens may indirectly die from trapping if their mother is killed in a trap or removed from the wild for veterinary treatment. Fernandez et al. (2002) observed an orphaned 3 month old Canada lynx kitten survive until at least 11 months of age on its own. However, kittens have starved after their apparent mothers had been trapped and killed (Bailey et al. 1986, Carbyn and Patriquin 1983, Parker et al. 1983). Bailey et al. (1986) suggested that the kittens were unable to find sufficient prey after the death of the adult females and that juvenile Canada lynx may be dependent on the hunting ability of their mother during their first winter. Kittens are generally weaned and no longer dependent on their mother by 12 weeks of age (McCord and Cardoza 1982, Tumlison 1987, Fernandez et al. 2002). However, Canada lynx kittens generally do not disperse from their family groups until 9 to 10 months of age (Parker et al. 1983, Koehler 1990) and this seems to be an important part of their life history. Maine's trapping season occurs when Canada lynx kittens are anticipated to generally be between five and seven months old. The ITP anticipates only three Canada lynx will be severely injured or killed (or permanently removed from the wild because of severe injuries). Because of uncertainty as to the fate of orphaned, weaned kittens, the MDIFW may capture (to the extent that they can) kittens orphaned from trapping or hold kittens until their mother is released or they are able to fend on their own (ITP section 5.2).

We believe that the likelihood that kittens will die because of failure to reunite with their mothers following release of capture (of either the kitten or the adult) or because of being orphaned in the wild is low. However, in our analysis of effects of capture, injury, and mortality from trapping on the Canada lynx population we have considered the possible effects of kitten mortality if their mother is removed from the wild because of a severe injury and the kittens are not detected or cannot be captured (see *Synthesis*, below).

(5) **Captures, injuries, and mortalities that occur in illegal leaning pole sets:** The ITP assumes that there will not be injuries or fatalities of Canada lynx from killer-type traps, largely based on the understanding that no Canada lynx have been reported captured or killed in legally-set killer-type traps to date. The ITP also addresses concerns about the accuracy of this assumption by including a changed circumstance whereby if even one Canada lynx is reported or discovered killed in a leaning pole set, the MDIFW will re-evaluate whether leaning poles are still effective avoidance measures or whether other measures might be more effective. In the event that this assumption is proven incorrect, MDIFW's changed

circumstance will allow modifications of the plan. Furthermore, any events that might occur in legal sets will be tallied against the take authorized by the permit.

The provisions for avoiding take via current or future requirements, mentioned above, do not address the effects of take that may occur in noncompliant sets that are unlikely to have occurred but for the provision for leaning pole sets under the program. In the past, there have been several Canada lynx fatalities in killer-type traps in Maine using the leaning pole set, where the investigations of these fatalities identified issues with the trap set that rendered the set illegal. Therefore, the ITP provides for additional compliance monitoring whereby wardens will annually check at least 80 trappers setting killer-type traps in the Canada lynx range to record the number of traps and trappers who set these traps in compliance with regulations and document areas of non-compliance. Although we believe this will minimize future Canada lynx mortality or severe injury from illegal sets, we have considered the possible impact of rare incidents in our analysis of effects of capture, injury, and mortality from trapping on the lynx population (see *Synthesis*, below).

Implications of uncertainty about the size of the Maine lynx population for the amount of take: As discussed in the **Environmental Baseline Section**, there is variability in estimates of the current size of the Maine Canada lynx population. However, the number of captures, serious injuries, and mortalities to be authorized by the proposed permit is independent of the number of Canada lynx in Maine. Furthermore, the size of the population would not affect undetected take because of possible inaccurate injury assessments, uncertainty about post-release survival and reproduction, or undetected effects on kittens if they or their mother is captured. These uncertainties are independent of the number of reported captures and serious injuries that occur. A larger population could plausibly lead to more unreported Canada lynx captures or captures in illegal leaning pole sets. To the extent that more unreported captures and captures in illegal sets in a larger population are attributable to MDIFW's trapping programs they could affect the absolute number of captures, injuries, and mortalities, but they will not affect the population growth rate[7] (i.e., slightly more take will be the same proportion in a larger Canada lynx population). See also the discussion of sustainable harvest rates (relative to the proposed action) in directed harvest programs in the section below on **Effect of Capture, Injury, and Mortality from Trapping on the Canada Lynx Population in the Action Area.**

Synthesis: As noted at the beginning of this section, the number of reported captures, injuries, and mortalities from trapping in sets that are compliant with the MDIFW regulations will be limited by the terms of the proposed permit. Except as discussed above, the efficacy of the ITP (including any changes that the MDIFW implements in response to changed circumstances as specified in the ITP) will not affect the magnitude of effects on Canada lynx. As described, the ITP incorporates measures to promote reporting captures, assure the accuracy of injury assessments and estimates of post-release effects on survival and reproduction, minimize indirect effects on kittens if they or their mothers are captured, and minimize incidents of capture in illegal leaning pole sets (which might logically be considered an unintended effect of the trapping program). We have reviewed these measures and find that they constitute sound approaches to assuring the congruence of estimated and actual effects on take from trapping in Maine.

[7] As used here, "growth rates" can be negative (declining) or positive.

We have considered the residual uncertainty from non-reporting, inaccuracy of some injury assessments, post-release effects of serious injuries, undetected effects on kittens, and compliance with regulations pertaining to leaning pole sets. Because of the inherent problems associated with quantifying unreported and undetected events and because the available evidence indicates that each of these individual factors will cause a marginal increase in overall take, we have accounted for their collective effect via discussion (in the next section) of rates of take that far exceed the amount to be authorized under the proposed action. We believe this is consistent with our responsibility to provide a reasonable benefit of doubt to the species.

Effect Of Capture, Injury, And Mortality From Trapping On The Canada Lynx Population In The Action Area

Here, we consider the effects of the incidental take from trapping on the Canada lynx population in Maine. We evaluate the population modeling provided in the ITP, and we also consider information from effects of directed Canada lynx harvest programs outside Maine and from directed bobcat harvest.

Population modelling projections: Appendix 7 of the ITP presents the results of modelling the effects of minor annual trapping mortality on Canada lynx population growth rates. The MDIFW used VORTEX 9.99 software to explore the effects of increased mortality on Canada lynx population growth rates based on demographic data collected in Maine between 1999 and 2010. VORTEX 9.99 is widely-used and publically-available software used to assess the viability of rare species' populations. Although the results of such population modelling exercises have limited accuracy to project absolute trends and abundance estimates, they can be particularly useful for comparing the relative effects of different scenarios that vary inputs of particular interest while holding the other inputs constant. Thus, we believe that most inputs used by the MDIFW in the modelling exercise are reasonable (e.g., no inbreeding depression, first age of reproduction, standard deviation of litter size, estimates of juvenile mortality rates), and we find that relative outputs associated with the modeled scenarios are informative notwithstanding uncertainty about estimates of inputs such as initial population size and carrying capacity and the inability of the model to account for snowshoe hare cycles or fluctuations[8]. For example, differences in growth rates among with- and without- trapping scenarios would be unaffected by the starting population size. The MDIFW compared 3 scenarios – a base run without any trap-related mortality that projected a modestly increasing population growth rate, a run with 3 added mortalities in the 15-year permit period, and a run with 3 trap-related mortalities (1 adult female, 1 adult male, and 1 yearling) each year during the 15-year permit period (i.e., 15 times the amount of take to be authorized under the proposed action). Even under the scenario of 15 times the rate of take under the proposed action, simulations showed a positive population growth, albeit at a lower rate than in the base scenario.

[8] The MDIFW completed the VORTEX analysis in 2007, prior to the submission of a draft ITP in 2008. At this time, hare populations were just beginning a decline that lasted from approximately 2006 to 2011. In the spring of 2007, Canada lynx reproductive rates had just begun to decline in response to the hare decline. Thus, the average reproductive rates used in the model reflect a period of high hare abundance and does not fully reflect the period of lower productivity associated with lower hare abundance observed from 2006 to 2010 (see Vashon et al. 2012, tables 1.2, 1.3). This would inflate the MDIFW's projections of population growth rate.

It is possible that the nine severely injured Canada lynx could experience lower productivity for their life because of their injuries[9]. It is also possible that the collective uncertainties discussed in the previous section (non-reporting, illegal take, etc.) would exceed the MDIFW's projected three mortalities during the permit period. However, we believe the actual take from the MDIFW's trapping programs is likely to be much closer to the MDIFW's modeled 3 mortalities over 15 years than to their scenario of 3 Canada lynx mortalities each year. Thus, differences in population trends with and without trapping are modest even if actual mortality or impaired reproduction is substantially higher than expected. Furthermore, the MDIFW's model assumed that all of the mortality would be additive (see discussion, below, of additive and compensatory mortality), which is likely to overestimate the population effects. Although the MDIFW's modeled scenario did not consider a baseline decreasing population trend (e.g., because of declining habitat conditions, incremental effects of climate change, and hare cycles or fluctuation that may occur over the next 15 years), our review of information from harvest programs, below, provides insight.

Information from management of directed Canada lynx harvest elsewhere in the range and bobcat harvest: Another way to analyze population effects is to consider effects of directed harvest of Canada lynx. Although there is no harvesting of Canada lynx in the Maine, Canada lynx and bobcat are hunted and trapped as furbearing animals throughout most of their range (Bailey et al. 1986, Poole 2003). Numbers of harvested Canada lynx and bobcat from directed sustainable trapping and hunting programs provides a comparison with effects of the proposed action.

It is generally assumed by furbearer biologists that a harvest rate of 20 percent is sustainable for bobcat populations (Knick 1990), but that variability in environmental factors may confound this (Anderson and Lovallo 2003). The New Mexico bobcat harvest quota is no more than 10 percent of the estimated population at: *http://www.nocrueltrapsonpubliclands.info/documents*; accessed on October 23, 2014). In Canada, Canada lynx and bobcats are considered to be moderately resilient to trapping harvest depending on prey abundance (Banci and Proulx 1999); bobcats tolerate harvest up to 20 percent (Knick 1990) and Canada lynx up to 40 percent at the peak of the hare cycle (Bailey et al. 1986, Quinn and Thompson 1987). For example, in Ontario during a period of high hare productivity a Canada lynx population increased despite an annual trapping mortality of 40 percent (Quinn and Thompson 1987). Harvest greater than 20 percent of a Eurasian lynx population in Norway was believed to be unsustainable (Linnell et al. 2010).

By contrast with directed harvest programs elsewhere and using the conservative estimate of 500 Canada lynx in Maine, the proposed action will authorize lethal take (i.e., 3 Canada lynx over the 15-year permit period) of an average of 0.04 percent of the population. Even if we hypothesize a worst case scenario where in the same year all 3 Canada lynx are killed, 9 Canada lynx are severely injured and all fail to reproduce during the rest of their life-times (effectively removing it from the population), and the other uncertainties described in the section above (unreported take, undetected severe injury, illegal take) cumulatively result in an additional 15 mortalities collateral to the program, the proposed action would remove 27 Canada lynx or 5.4 percent of a Canada lynx population of 500, far below the rates that occur in sustainable harvest programs.

[9] The demographic effect of a Canada lynx that experiences impaired reproduction is the same as that of a Canada lynx with reduced survival. A Canada lynx that does not reproduce does not contribute to the long-term population.

For a population of 500 Canada lynx at the high point of the hare cycle, annual trapping mortality would have to exceed 50 to 100 Canada lynx, or 10 to 20 percent respectively, before Canada lynx populations would be impacted. Thus, even if lethal take from trapping in Maine was a magnitude higher than anticipated by the MDIFW, it is almost certain to be below the threshold for population effects.

Our analysis does not assume that mortality in directed harvest programs is always compensatory, where the trapping-related deaths are substituted for deaths that would occur naturally. Additive mortality is "harvest" in addition to all the animals that would have died naturally. Natural mortality of a Canada lynx population may be 5 to10 percent during years of increasing or high hare abundance to 60 to70 percent during years of low hare abundance (Brand and Keith 1979, Ward and Krebs 1985, Koehler 1990, Poole 1994, Slough and Mowat 1996). Thus, mortality from Canada lynx trapping during the two to three winters after a snowshoe hare decline may be at least partially compensatory (Canada lynx that would have otherwise died of other sources of mortality)(Poole 1994, Slough and Mowat 1996). However, Brand and Keith (1979) and Koehler and Aubrey (1994) concluded that, because most natural mortality occurs during the summer months prior to fall/winter trapping season, trapping mortality could be additive (i.e., in addition to other sources of natural mortality). Creel and Rotella (2010) also cautioned against the assumption that human-caused sources of mortality will be offset by a decline in natural mortality (i.e., compensatory mortality).

We also recognize the possibility that Canada lynx may be more vulnerable to trapping during periods of low or declining hare density. When prey is scare and Canada lynx densities are decreasing, Canada lynx may increase their movements to search for food and/or become more attracted to bait than at high hare densities (Brand and Keith 1979). In the Northwest and Yukon Territories, untrapped Canada lynx populations had annual mortality rates of 8 to11 percent and 0 to 22 percent, during hare population peaks, and mortality rates of 63 percent to 75 percent and 0 to 60 percent during hare lows, respectively (Poole 1994, Slough and Mowat 1996). It is plausible that the absolute number of Canada lynx trapped in a smaller population would be lower than anticipated under the ITP, but that they might constitute a slightly larger proportion of the population.

As discussed under the **Environmental Baseline Section** of this biological opinion, the scope, scale, and effects of climate change on Canada lynx in Maine during the 15-year permit period of the proposed action are uncertain. However, the best available information suggests that differences in the Maine Canada lynx population trend with and without incidental trapping under the proposed action will be very small under a range of climate-induced changes that could affect Canada lynx during the 15-year permit period.

Synthesis: Canada lynx populations in Maine are currently high, and except for a recent period of hare decline, the population has exhibited relatively high reproduction, survival, and recruitment rates (Vashon et al. 2012). Under these conditions, trapping-related mortality as contemplated in the proposed action is almost certain to be compensatory. Furthermore, there may be relatively high interchange (immigration and emigration) between Maine and the Gaspe region of Quebec, which currently is in a period of liberal Canada lynx harvesting regulations and northern New Brunswick where Canada lynx are protected as a provincial listed species. If

the carrying capacity of Maine's habitat declines by 50 to 60 percent over the next 20 years as do lynx population (Simons 2009) or hare populations cycle or fluctuate to lower levels as they did recently (or both), the populations would be expected to decline throughout the region and trapping-related mortality could become additive. Even under this scenario, the amount of incidental take that will be authorized under the ITP is extremely unlikely to affect Canada lynx recovery, even when accounting for all the factors discussed above. Canada lynx are relatively fecund and populations can increase rapidly during periods of increasing or abundant prey (Mowat et al. 2000, Slough and Mowat 1996). Canada lynx also have been shown to disperse great distances, and therefore have the ability to re-colonize vacant habitats. We conclude that population level effects of incidental trapping as anticipated by the MDIFW are likely to range from completely compensatory during periods of high hare populations to small and short-lived during periods of low hare populations and declining Canada lynx numbers.

Other Effects Of Trapping

Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably likely to occur (50 CFR 402.02). We also considered the following effects.

Incidental trapping of snowshoe hares: Snowshoe hares are incidentally captured in foothold and killer-type traps (Novak 1987, Barrett et al. 1989, Proulx et al. 1989, Mowat et al. 1994, Naylor and Novak 1994) and can be live-trapped in Maine by beagle clubs. Since the MDIFW does not have records of how many snowshoe hares are taken by fur trappers, we used two approaches to estimate how many snowshoe hares are currently taken in Maine.

In the first approach, we reviewed marten trapping studies in Ontario (Naylor and Novak 1994) and Alberta (Barrett et al. 1989). Since trapping conditions and regulations in these two jurisdictions are different than in Maine, application of these studies is imperfect, but they represent some of the very limited data available to estimate the effects of trapping on snowshoe hares. In Alberta, no snowshoe hares were taken for 55 marten trapped (0 percent of target species) (Barrett et al. 1989) and in Ontario, 18 snowshoe hares were taken for 408 marten taken (4 percent of target species)(Naylor and Novak 1994). If similar ratios were applied to Maine marten harvest in recent years (2,350 to 5,529 animals), 0 to 244 snowshoe hares could be taken in northern Maine annually. Additional snowshoe hares could be taken incidental to trapping other upland furbearers like coyotes, fox, fisher, raccoons, and other species. We lack similar ratios of snowshoe hares to other furbearers so we doubled the estimates derived above for marten trapping. Thus up to 732 hares may be incidentally trapped.

The second approach considered data from the MDIFW's Canada lynx telemetry study. The MDIFW caught 48 snowshoe hares in foothold traps set for Canada lynx in 15,403 trap nights (0.31 hares per 100 trap nights) while trapping for Canada lynx (MDIFW *Partnership for Lynx Conservation in Maine* reports 1999 to 2007). If Maine fur trappers average 110,000 foothold trap nights in Canada lynx WMDs (ITP section 3.1), then 342 snowshoe hares may be incidentally trapped.

We considered the likelihood that, under the proposed action, incidental trapping of snowshoe

hares may increase because of larger foothold traps, cage traps, and cable restraints (depending on minimum loop size) because of increased late-season trapping effort and the non-selectivity of cage and cable restraints. If incidental trapping of snowshoe hares increases by 20 percent, then the highest estimate from the methods described above (732 trapped hares) would increase to 878 snowshoe hares trapped in northern Maine.

Landscape hare densities in northern Maine currently average 0.24 hares per acre (Simon 2009, Scott 2009); therefore approximately 1.6 million snowshoe hares are likely present in the 6.8 million-acre Canada lynx critical habitat area. Thus, incidental trapping may remove at most 0.05 percent (878 from a population of 1.6 million) of the population. Therefore, we conclude that trapping activities under the proposed action will have an insignificant effect on the presence of snowshoe hares available to Canada lynx in the action area.

Trapper use of snowmobiles: As discussed in the **Environmental Baseline Section**, studies conducted elsewhere in the DPS provide little evidence to support suggestions that snow compaction by snowmobiles adversely affects Canada lynx or their habitats. Although we do not have information about coyote use of snowmobile trails in Maine, we note that coyotes (hypothesized to be advantaged by snowmobile compaction) have not been found to be an important predator of Canada lynx in Maine (Vashon et al. 2012). Furthermore, although trappers sometimes use snowmobiles to access more remote areas later in the winter when snow precludes other means of access, use by trappers (6,000 statewide, only a fraction of who trap in Canada lynx areas) is likely to constitute a small fraction of overall snowmobile activity in the range of Canada lynx in Maine. Therefore, we find that the existing science supports insignificant adverse indirect effects on Maine Canada lynx due to trappers using snowmobiles.

Trappers driving on forest roads: The **Environmental Baseline Section** acknowledges that lynx are killed by vehicle collisions. Although trappers often rely on existing forest roads to access their trap lines, they constitute a very small fraction of total use that is also distributed very sparse across the 10,123 square miles of Canada lynx critical habitat in Maine. Many of the 34 Canada lynx reported killed on Maine roads were killed on major logging roads where vehicle speeds are greater. Traffic generated by an average of 613 trappers in northern Maine is a small fraction of the traffic (both forestry and recreational) use of these forestry roads. Furthermore, trappers would likely access areas for trapping on networks of small forestry roads, where driving conditions prevent higher speeds and there is virtually no risk of road mortality to Canada lynx. No Canada lynx have been reported hit by a trapper's vehicle. Therefore, we find that trappers driving on forest roads in the course of conducting trapping activities under the proposed action will have an insignificant effect on Canada lynx.

Trapping fishers: The **Environmental Baseline Section** acknowledges that Canada lynx are killed by predators, including fishers in Maine. The MDIFW believes that trapping benefits Canada lynx by killing fishers within the Canada lynx ranges (ITP section 4.2). The MDIFW provides an analysis that illustrates how the current level of fisher harvest in northern Maine could hypothetically save 29 Canada lynx from fisher mortality each year. We acknowledge that Canada lynx kill fishers, but question whether the assumptions in the MDIFW's analysis are valid and whether temporarily reducing fisher populations during the trapping season could affect the number of Canada lynx killed by fishers annually. Many factors could affect predation

rates. For example, some Canada lynx may be predisposed to predation by parasites, disease, starvation, or injury. Some fishers (larger males?) may be responsible for most of the predation that occurs on Canada lynx, and it is possible that trapping may be more selective toward juveniles and female fishers. Weather, snow conditions, and availability of prey may affect circumstances related to predation events. Given the many uncertainties and lack of scientific data, we cannot accept or reject the hypothesis that trapping benefits Canada lynx populations.

Effects Of Incidental Take Plan Mitigation Activities On Canada Lynx

As described in the ITP (section 5.3), mitigation compensating for the death or permanent removal from the wild of 3 Canada lynx during the 15-year life of the permit is for the MBPL to maintain and enhance 6,220 acres of high quality hare habitat on a 23,046-acre area on the Seboomook Unit. A memorandum of understanding (MOU) between the MDIFW and the MBPL establishes the agreement for the MBPL to implement the mitigation in accordance with the ITP. The MBPL will develop a forest management plan within three years of permit issuance that demonstrates how the mitigation commitments will be achieved and provides a detailed prescription for forest stand treatments. While forest management activities could be constrained by other resource objectives (such as providing for deer wintering areas, maintaining riparian habitat), the forest management plan will explain how Canada lynx habitat management is conducted in consideration of other resource issues in the mitigation area.

The size of the Canada lynx population in Maine is most dependent on the distribution, juxtaposition, and extent of snowshoe hare habitat and populations (i.e., landscape hare density is the primary factor influencing Canada lynx occupancy of habitat in Maine (Simons 2009, Simons-Legaard et al. 2013)). Snowshoe hare habitat and populations are correlated with the amount of early successional stage conifer (i.e., softwood) forest habitat. Therefore, as that forest type changes, so does the hare population followed by the Canada lynx population. Much of the current high quality hare habitat in the Canada lynx range in Maine (regenerating softwood 15 to 35 years post-harvest) was created as a legacy of clearcutting during the spruce budworm era (1973-1985). Much of that habitat is now getting older and growing out of stand conditions that support high hare populations. Because of the Maine Forest Practices Act (1989) clearcutting has largely been replaced by various forms of partial harvest, many of which do not produce high hare densities. Thus, a near-term threat to the existing Canada lynx population in Maine is the loss of high quality hare habitat. Many areas that currently support Canada lynx may soon not be able to do so as landscape hare densities decline. Forest management to maintain and enhance at least 6,220 acres of high quality hare habitat on the Seboomook Unit is designed to help counter this threat.

The Seboomook Unit currently has a high probability of supporting Canada lynx and likely supports a breeding unit (an adult male and up to three adult females)(Simons 2009, p. 100, 102). The ITP describes at least three forestry scenarios whereby Canada lynx habitat may be maintained or enhanced on the mitigation area.

1. Regenerating softwood clearcuts from the spruce budworm era. The ITP describes a legacy of the regenerating clearcuts (ITP figure 5.3.2), which seems to be the prevalent source of Canada lynx habitat on this portion of the Seboomook Unit. Absent the proposed mitigation, the MBPL would have managed these stands area for mature

softwood by pre-commercial or commercial thinning 35-year-old and older regenerating softwoods (formerly clearcut) to accelerate growth to mature, merchantable forest products (and also to promote deer wintering habitat, ITP p. 118). The MBPL will "recycle" existing regenerating clearcuts when they no longer support high hare populations.

2. Shelterwood harvests. The ITP describes a legacy of shelterwood harvests from forestry conducted from previous landowners (ITP p. 118, J. Wiley, MDIFW/MBPL pers. comm. August, 20) likely in the 1990s. The acreage and location of these stands are unclear, but the MBPL describes two different stand conditions; a) the understory developed, growing and currently HQHH, and b) the understory growth arrested and currently not HQHH. Absent the proposed mitigation, it is uncertain how the MBPL would have managed these stands, but typically the MBPL does a sequence of "overstory removals" until all the older trees are removed from the stand and the understory replaces the older stand (J. Wiley, MDIFW/MBPL pers. Comm. August 19, 2014) so some of this management may have occurred without mitigation.
3. Harvest of mature softwood stands. Mature softwood and mixed wood stand types occur in the mitigation area (S3 and M3 stand types in ITP figure 5.3.4) and could be cut (by clearcut, heavy partial harvest or shelterwood harvests) to create regenerating softwood that would develop into HQHH. There are at least 1200 acres of mapped and zoned deer wintering areas in the mitigation area that may encompass much of the mature conifer present on the Seboomook Unit (the zoned deer yards likely limited the ability for previous landowners to harvest these areas). The MDIFW indicated that Canada lynx management would take preference over deer wintering management (J. Connolly, MDIFW, pers. comm. August 19, 2014), but there may be other implications for doing so. It is unclear whether some of this management may have occurred without the mitigation component of the ITP.

Thus, the greatest opportunity for Canada lynx management (in respect to acreage) would be to "recycle" existing regenerating clearcuts when they no longer support high hare populations (about 35 years after clearcutting). Although it is uncertain whether there are markets for the MBPL for these young trees and whether this forest management will result in a financial loss.

Thus, under a "without mitigation scenario," HQHH created from clearcutting in the 1970s and 1980s would eventually decline, Canada lynx would likely diminish in number or discontinue to use the Seboomook Unit because of a declining prey base. Under the proposed action, however, the MBPL is most likely to "recycle" regenerating clearcuts after they no longer support high densities of Canada lynx and increase overstory removal of some partially harvested stands to release the regenerating softwood understory, which will become future high quality hare habitat. Forest modeling will be used to confirm that the amount of mitigation forestry is adequate to offset the loss of three Canada lynx.

In addition, the MBPL will preclude the use of precommercial thinning on the mitigation area. Hand crews thin regenerating softwood stands when they are young (8 to 15 years old) to an 8 or 10 foot spacing to reduce competition and enhance the growth of the young trees. Precommercial thinning reduces horizontal stem density and substantially reduces hare densities by up to half the populations that occur on unthinned stands (Homyack et al. 2005, 2007). The MBPL will

forego the financial benefits of precommercial thinning (especially on their best quality site); however, this practice will ensure high hare populations occur in regenerating softwood stands.

Key components of the mitigation commitment include collecting the forest stand information, modeling the trajectory of baseline HQHH, identifying when shortfalls in habitat (and the local Canada lynx population) are expected, and developing the management plan, which ultimately will describe how the Seboomook Unit will be managed to achieve the habitat conditions that will offset three Canada lynx fatalities from trapping. Important variables will include the trajectory of baseline HQHH, the acreage amount and location that will be required for treatment, and how and when those treatments will be completed. Once the stands are treated (e.g., biomass harvesting of 35-year-old regenerating clearcuts or overstory removal for existing two-story softwood stands), there will be a lag time of 3 years (some established shelterwood cuts) to 15 years (new heavy partial harvests or shelterwood cuts) before the stand is in a condition to provide high quality hare habitat. After the stands achieve high horizontal stem density, they will provide HQHH for about 20 years before again maturing past the optimal conditions. During that 20 year period, Canada lynx will continue to be on the landscape in response to the mitigation efforts. Even though that period is likely to extend past the end of the ITP term, it is the forest management treatments that occurred within or beyond the 15-year permit period (2029) that create the required mitigation and ultimately allow Canada lynx to persist in the area.

The forest model and forest management plan will demonstrate that implementation will provide sufficient foraging habitat to support three Canada lynx that would otherwise have discontinued use of the mitigation area (this may occur by creating habitat or maintaining habitat that would otherwise be lost to succession or that would not otherwise have been harvested under the MBPL's current forestry paradigm).

The ITP includes changed circumstance provisions that establish contingencies in case the forest management plan cannot meet the required Canada lynx mitigation objectives. If triggered, the mitigation commitment would likely either have to incorporate more acreage for treatment (i.e., expand the mitigation area), extend the treatment for a longer duration, or shift to a new mitigation area. These changes would also likely trigger the need to modify the MOU between the MDIFW and the MBPL. If these changes are sufficient to trigger an amendment to the ITP and/or incidental take permit, then section 7 consultation would also be reinitiated.

The Canada lynx that continue to use the Seboomook area because of hare habitat enhancement implemented under the proposed action (i.e., habitat that would otherwise be lost) are considered as the offset for the purpose of compensating for take. Furthermore, although trapping mortality may often be compensatory (i.e., offset mortality that might have occurred because of natural causes); benefits to the Canada lynx population from improving habitat conditions (or preventing a habitat decline) are always additive.

Summary

Over the life of the permit, up to three Canada lynx may be killed or have injuries severe enough that they cannot be fully rehabilitated and subsequently released; up to nine may be severely injured but released following rehabilitation; and the remainder (i.e., 183 Canada lynx) will be

released with only minor injuries. After considering several factors that affect these estimates, we generally concur with their accuracy. However consistent with our responsibility to provide a reasonable benefit of doubt to the species where there are uncertainties, we have considered the possibility that the collective effects of these factors will result in modest additional undetected reductions in Canada lynx survival or reproduction. Based on information from Canada lynx population model projections and from the observed results of directed Canada lynx and bobcat harvest programs, we find that the effect of anticipated mortalities and injuries on the Canada lynx population are likely to range from completely compensatory during periods of high hare populations to small and short-lived during periods of low hare populations and declining Canada lynx numbers. We find that the indirect effects of trapper use of snowmobiles, driving on forest roads, or trapping snowshoe hares are insignificant. Enhancement of Canada lynx habitat at the MBPL's Seboomook Unit must clearly demonstrate that the mitigation will offset mortality of three Canada lynx incidentally killed by trapping activities. Furthermore, although trapping mortality may often be compensatory, benefits to the Canada lynx population from improving habitat conditions (or preventing a habitat decline) are always additive.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

In the **Effects of the Proposed Action Section**, we have already discussed biological impacts from potential unreported captures and captures in illegal leaning pole sets. Although they might alternatively be construed as independent of the MDIFW's trapping program (hence, cumulative effects), we do not account for them again.

In Maine, the majority of Canada lynx habitat occurs on private, industrial forest lands (Hoving 2001, Simons 2009, FR 74 8616 - 8702). The Maine Forest Practices Act (1989) restricts the size of clearcuts (less than 250 acres) and places limitations on clearcuts (notification, separation zones between cuts, harvest plans, inspections). As a result, forest landowners have changed their harvest practices to extensive use of precommercial thinning and partial harvesting rather than clear cutting (Gadzik et al. 1998, Homyack 2003; Krohn 2003). These techniques result in forest stands with sparse understories that support low snowshoe hare densities (Homyack 2003, Robinson 2006, Scott 2009).

The MBPL policies require them to work in cooperation with the MDIFW, Service, and other agencies to manage State lands for State and federally listed endangered, threatened and candidate species. The MBPL lands are also enrolled in forest certification programs that have similar requirements. One may argue that the MBPL should have already been managing for Canada lynx, thus, these activities should already have occurred and that these commitments are not mitigation. However, the MBPL had not instituted a Canada lynx management program on State lands. The Seboomook Unit is one of the few State lands that is has a sufficient landscape to manage for Canada lynx. Thus, this represents an additional area where Canada lynx will be managed in Maine. The Service has similar Canada lynx management plans with four other

private landowners in northern Maine through the Healthy Forest Reserve Program through the Natural Resource Conservation Service, U. S. Department of Agriculture.

Over the life of the proposed action, it is reasonably certain that most private landowners will continue to implement partial harvest forms of forestry, many of which diminishes landscape hare densities, which will diminish habitat conditions for snowshoe hare and Canada lynx (Simons 2009). The mitigation will help retain Canada lynx on a landscape where they otherwise would have been lost.

Conclusion

The jeopardy analysis in this biological opinion assesses whether the proposed action would be reasonably expected, directly or indirectly to reduce appreciably the likelihood of both survival and recovery of the Canada lynx by reducing their reproduction, numbers, or distribution in the wild. Jeopardy determinations are ultimately made for the listed entity, which is the rangewide distribution for the contiguous U.S. DPS of the Canada lynx. However, the jeopardy analysis is best conducted in the context of an analytical framework that addresses the effects at various scales, beginning with the smaller, local population levels. Since the action area for this proposal is the entire State of Maine, we start by considering the effects of ITP on the Maine Canada lynx population. Because we demonstrate that, in the context of the environmental baseline for the action area and the anticipated cumulative effects, risks to the Maine Canada lynx population are unlikely to be appreciable, then risks are even more unlikely at larger population scales (i.e., Canada lynx in the northeastern United States or in the entire DPS), and we conclude that the action is not likely to jeopardize the continued existence of the species rangewide.

In formulating this biological opinion, we consider the following points discussed in earlier in this document:

1. The primary factor driving affecting Canada lynx abundance and distribution in the action area is the abundance of snowshoe hare, their primary prey. Snowshoe hare density is, in turn, determined by the quantity and quality of boreal forest stands that have a dense horizontal understory, conditions that are generally found in unthinned forests that are approximately 15 to 35 years old.

2. Continuation of recent forest management practices that do not favor habitat conditions for snowshoe hare and Canada lynx is a non-Federal action that is reasonably certain to occur in the action area. Canada lynx habitat in Maine could decline by up to 65 percent in the next 20 years.

3. Climate change may affect Canada lynx via effects on the distribution of boreal forest and areas of persistent deep fluffy snow, as well as other more subtle paths such as incidents of fire and insect outbreaks, parasites and disease, and indirect effects on abundance of other wildlife that competes with or preys on Canada lynx; the scope and scale of such changes are uncertain, however, and the effects (positive or negative) on Canada lynx may be variable across the landscape. We are not currently aware of climate-induced factors that could increase to such an effect that they would affect Canada lynx populations in the next 15-

years. However, we caution that other effects of climate on wildlife populations in recent years (e.g., winter ticks *Dermacentor albipictus* affecting Maine's moose population) have developed over a relatively short period of time.

4. Predation by other wildlife species, competition with other wildlife species, vehicle collisions, trapping, and shooting are less influential, but non-discountable factors affecting Canada lynx in the action area.

5. Over the life of the proposed action, up to three Canada lynx may be killed or have injuries severe enough that they cannot be fully rehabilitated and subsequently released; up to nine may be severely injured but released following rehabilitation; and the remainder (i.e., 183 Canada lynx) will be released with minor injuries. After considering several factors that affect these estimates, we generally concur with their accuracy. However consistent with our responsibility to provide a reasonable benefit of doubt to the species where there are uncertainties, we have considered the possibility that the collective effects of these factors
6. will result in modest additional detected and undetected reductions in Canada lynx survival or reproduction, which we factored into a revised take estimate.

7. Based on information from Canada lynx population model projections and from the observed results of directed Canada lynx and bobcat harvest programs, the effect of anticipated mortalities and injuries on the Canada lynx population is likely to range from completely compensatory during periods of high hare populations to small and short-lived during periods of low hare populations and declining Canada lynx numbers.

8. The indirect effects of trapper use of snowmobiles, driving on forest roads, or trapping snowshoe hares are insignificant.

9. Enhancement of Canada lynx habitat at the MBPL's Seboomook Unit will offset mortality of three Canada lynx incidentally killed by trapping activities during the life of the permit. Furthermore, although trapping mortality may often be compensatory, benefits to the Canada lynx population due to improving habitat conditions (or preventing a habitat decline) are always additive.

After reviewing the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, we find that the proposed action is not reasonably expected to reduce appreciably the likelihood of both survival and recovery of the Canada lynx by reducing their reproduction, numbers, or distribution in the wild. The number of Canada lynx killed or severely injured such that they cannot be released or that will suffer reduced survival and reproductive output is small in relation to the size of the Maine population, and the population-level effects of their loss will be compensatory or short-lived. These trapping-related mortalities and injuries are likely to be distributed across a very large geographic area and over the 15-year life of the permit and will not result in any impact to the Canada lynx population. Although the benefits of the mitigation will be located in a more closely defined portion of the action area, the positive effects will be additive and enduring. Thus, the net effects of the proposed action on Maine's Canada lynx population will range from neutral during periods of high hare populations (when trapping mortality and reduced reproductive output is compensatory) to minor during periods of declining

habitat and low hare populations (when trapping mortality is additive). Since effects to the Maine Canada lynx population are unlikely to be appreciable under either scenario, we conclude that the proposed action is not likely to jeopardize the continued existence of the contiguous U.S. DPS of the Canada lynx.

Determination Of Effects On Critical Habitat Designated For The Canada Lynx

In this section, we examine the effect of the proposed action on the primary constituent elements (PCEs) to determine if the project is likely to adversely affect the critical habitat. If the proposed action is not likely to adversely affect the critical habitat, then the consultation process is terminated (50 CFR 402.13(a).

Status of Designated Critical Habitat In Maine

The Service published a revised designation of critical habitat for the contiguous U.S. DPS of the Canada lynx on September 12, 2014. In total, 38,954 square miles fall within the boundaries of the revised critical habitat designation, in five units in the States of Maine, Minnesota, Montana, Wyoming, Idaho and Washington.

Canada lynx critical habitat Unit 1 totals 10,123 square miles located in northern Maine in portions of Aroostook, Franklin, Penobscot, Piscataquis, and Somerset Counties. This area was occupied by the Canada lynx at the time of listing and is currently occupied by the species. This area is important for Canada lynx conservation because it is the only area in the northeastern region of the Canada lynx's range within the contiguous United States that currently supports a resident breeding Canada lynx population and likely acts as a source or provides connectivity with Canada for more peripheral portions of the Canada lynx's range in the Northeast.

Primary Constituent Element

Within the critical habitat units, the PCE for the Canada lynx is boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:

(1) Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface;

(2) Winter conditions that provide and maintain deep fluffy snow for extended periods of time;

(3) Sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and

(4) Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a Canada lynx home range) such that Canada lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on October 14, 2014.

The 2014 revised critical habitat designation also described three types of Federal actions that may adversely affect critical habitat:

(1) Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by Canada lynx. Such activities could include, but are not limited to, forest stand thinning, timber harvest, and fuels treatment of forest stands. These activities could significantly reduce the quality of snowshoe hare habitat such that the landscape's ability to produce adequate densities of snowshoe hares to support Canada lynx populations is at least temporarily diminished.

(2) Actions that would cause permanent loss or conversion of the boreal forest on a scale proportionate to the large landscape used by Canada lynx. Such activities could include, but are not limited to, recreational area developments; certain types of mining activities and associated developments; and road building. Such activities could eliminate and fragment Canada lynx and snowshoe hare habitat.

(3) Actions that would increase traffic volume and speed on roads that divide Canada lynx critical habitat. Such activities could include, but are not limited to, transportation projects to upgrade roads or development of a new tourist destination. These activities could reduce connectivity within the boreal forest landscape for Canada lynx, and could result in increased mortality of Canada lynx within the critical habitat units, because Canada lynx are highly mobile and frequently cross roads during dispersal, exploratory movements, or travel within their home ranges.

In matrix habitat (forested habitat that Canada lynx travel through to get to boreal forest with dense understory), activities that change vegetation structure or condition would not be considered an adverse effect to Canada lynx critical habitat unless those activities would create a barrier or impede Canada lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential home range, or if they would adversely affect adjacent foraging habitat or denning habitat. For example, a pre-commercial thinning or fuels reduction project in matrix habitat would not adversely affect Canada lynx critical habitat, and would not require consultation. However, a new highway passing through matrix habitat that would impede Canada lynx movement may be an adverse effect to Canada lynx critical habitat, and would require consultation. The scale of any activity should be examined to determine whether direct or indirect alteration of habitat would occur to the extent that the value of critical habitat for the survival and recovery of Canada lynx would be appreciably diminished.

Effects Of Trapping Activities On Critical Habitat

Although all of Unit 1 of the designated critical habitat and the proposed revised critical habitat is within the action area, trapping activities as proposed in the ITP will have insignificant effects

on the PCE. Trapping activities will not affect Canada lynx denning sites, the availability or quality of matrix habitat, or the condition of snowshoe hare habitat.

One component of the PCE is presence of snowshoe hares. As discussed in the earlier section of this document (*Effects Due to Incidental Trapping of Snowshoe Hares, Trapper Use of Snowmobiles, and Trappers Driving on Forest Roads*) snowshoe hares may be incidentally captured in foothold and killer-type traps. However, two approaches to estimating the number of snowshoe hares taken in Maine (described above) lead to the conclusion that incidental trapping is likely to remove less than 0.05 percent of the snowshoe hare population. Therefore, we conclude that trapping activities under the proposed action will have an insignificant effect on the presence of snowshoe hares available to Canada lynx in the action area.

Another component of the PCE is deep fluffy snow. Although snowmobiles may compact snow, available studies in the Northern Rockies failed to support the hypothesis that snow compacted routes adversely affect Canada lynx habitat (see page 19). As explained on page 30, use of snowmobiles to conduct trapping activity constitutes a small fraction of overall snowmobile activity in the range of Canada lynx in Maine. Therefore, we find that use of snowmobiles during trapping in the range of the Canada lynx in Maine will have an insignificant adverse effect on deep fluffy snow.

The 2014 revised Canada lynx critical habitat designation identifies Federal actions that increase traffic volume and speed on roads that divide critical habitat, including upgrading roads or development of a new tourist destination, as potential adverse effects on critical habitat. The proposed action entails no upgrading of roads. The number of trappers in Maine is small, but nearly all of them would be expected to use roads within the critical habitat to set and tend their traps. Road use during trapping would not stimulate road upgrades in the critical habitat and it constitutes a small proportion of existing traffic volume. Therefore, we find that trappers driving on forest roads in the course of conducting trapping activities under the proposed action will have an insignificant effect on the function of critical habitat.

Effects Of The Incidental Take Plan Mitigation On Critical Habitat

Mitigation activities proposed in the ITP will maintain or enhance 6,220 acres of high quality hare and Canada lynx habitat on a 22,046 acre area on the MBPL's Seboomook Unit. These activities are specifically targeted at the enhancement of habitat conditions that will benefit Canada lynx (i.e., dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface). Hence the PCE
will benefit from the mitigation.

Determination That The Proposed Action Is Not Likely To Adversely Affect Canada Lynx Critical Habitat In Maine

We conclude that the proposed action is not likely to adversely affect the PCE and, hence, that it will not adversely affect critical habitat designated for Canada lynx in Maine. Incidental trapping and the use of snowmobiles by trappers will have insignificant effects on the number of

snowshoe hares and on snow conditions. Trappers driving on forest roads constitute an insignificant portion of traffic volume on roads within the Canada lynx critical habitat. The effects of the proposed ITP mitigation activities on the PCE will be wholly beneficial. Therefore, we find that no further consultation on the effects of the proposed action on the Canada lynx critical habitat is warranted.

Incidental Take Statement

Section 9 of the ESA and Federal regulations under section 4(d) of the ESA prohibit the taking of endangered and threatened species, respectively, without special exemption. Take is defined in section 3 of the ESA to mean harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm is further defined by regulation (50 CFR 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by regulations as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the ESA, provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The proposed ITP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize those impacts. **All measures described in the ITP and any section 10(a)(1)(B) permit issued with respect to the ITP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR §402.14(i).** Such terms and conditions are non-discretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the ESA to apply. If the permittee fails to adhere to these terms and conditions, the section 10(a)(1)(B) permit may be suspended or revoked.

Amount And Extent Of Take

In accordance with the ITP and permit, we anticipate that:

1. No more than 195 Canada lynx will be *captured* via *trapping* over a 15-year permit period.

2. No more than three Canada lynx of the 195 Canada lynx that are captured will be *killed* or have injuries (i.e., *wounds*) severe enough that they cannot be fully rehabilitated and subsequently released.

3. No more than nine of the 195 Canada lynx that are captured will be severely injured (i.e., *wounded*) but released following rehabilitation. Following release, these nine Canada lynx may experience significant disruption of normal behavior patterns including, but not

limited to, breeding, feeding, and/or sheltering (i.e., *harassment*). Specifically, these disruptions may curtail survival and life-time reproductive output of some of the nine Canada lynx. We have limited information to estimate the proportion of the severely injured Canada lynx that will experience significantly disrupted behavior patterns or the extent of the disruption. Even with post-release monitoring of rehabilitated Canada lynx (as provided in the ITP), it may be difficult to ascertain the role of injuries in survival and/or reproduction. For the purposes of this incidental take statement, we estimate that no more than four severely injured Canada lynx will experience moderate reduced post-release survival or reproductive output, but we recognize that the underlying information is scant.

We do not anticipate that Canada lynx trapped and released with no or only minor injuries will experience any significant disruption of normal behavioral patterns; hence, no allowance is provided for such take. Although we considered the possible indirect effect of trapping from illegal sets in formulating its biological opinion, any such take would be unlawful; hence, no incidental take allowance is provided. We also considered the indirect effect of unreported take.

Effect Of The Take

Through the analysis in this biological opinion, we have determined that this level of anticipated take is not likely to result in jeopardy to Canada lynx.

Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid the adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information.

We have identified the following action that would further the conservation and assist in the recovery of Canada lynx in Maine. Over the life of the proposed action, Maine's Canada lynx population is expected to decline in response to a maturing forest and associated decline in amount and quality of hare habitat (Simons 2009). Although the forest management activities that will be implemented at the MBPL's Seboomook Unit will help counter threats from declining habitat, this area represents only a fraction of the current Canada lynx range in Maine. The Service should continue to work with private and State landowners to implement silvicultural practices that will provide reliable future Canada lynx habitat conditions.

Reinitiation Notice

This concludes the formal intra-Service consultation on the issuance of an incidental take permit to the MDIFW. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in

a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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